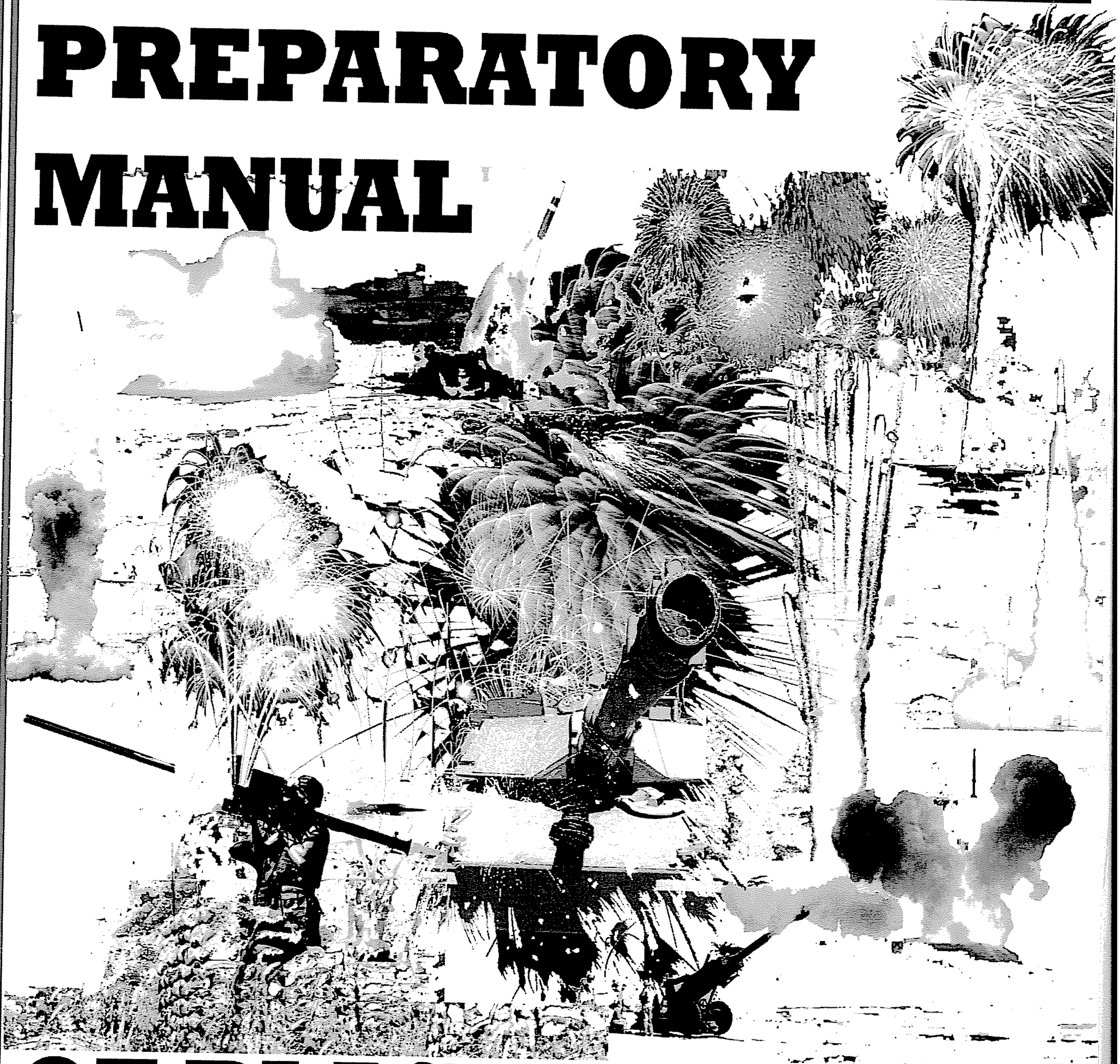
PREPARATORY MANUAL



OF BLACK POWDER AND PYROTECHNICS

A Comprehensive Reference Manual on the World's most widely used Pyrotechnic Mixtures

A BOOK BY JARED LEDGARD

THE PREPARATORY MANUAL OF BLACK POWDER AND PYROTECHNICS

FIRST EDITION

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The Preparatory Manual of Black Powder and Pyrotechnics

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Cover photograph of fireworks displays, with a view of an MI Abraham's US Army Tank in the center foreground, with various military and commercial munitions being shown in heightened color.

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Chapter 1: Pyrotechnic compositions

1a. Introduction to pyrotechnics

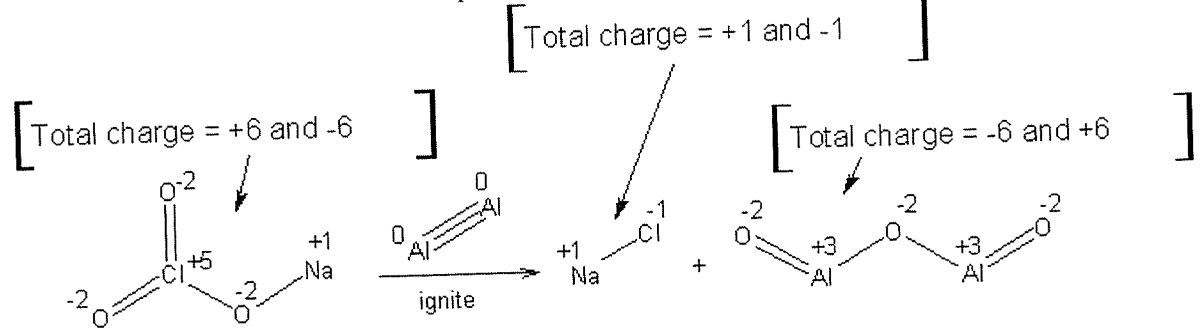
The field of pyrotechnics is very old, and dates back to the ancient Chinese dynasties. Of coarse in those days, there where only a few known pyrotechnics compositions, one of which being black powder. Black powder is probably one of the oldest chemical concoctions known to man. This concoction, however very simple, has re-defined history, culture, leaders, governments, and kingdoms. Empires have risen and fallen on the back of black powder, and our modern civilization that we known of, was shaped and coexists because of black powder, and its simple pyrotechnic ability. Today, black powder is seldom even considered for use in anything other then fireworks, old muskets guns used by hobbyists, and cannons for old war re-enactments. Other then these entities, black powder has very little use outside the area of fireworks, and remains an ingredient for the hobbyist, mainly black powder time fuse, and personally owned cannons for home and recreational use, such as firing salutes during weekend celebrations, or during a touchdown by the home team. Today, the world of pyrotechnics has expanded far beyond the realm of simple black powder cannons and small arms weapons such as muzzle-loaded firearms. Today, pyrotechnics occupies a much broader field not just in fireworks, but also in the areas of gun propellants, smoke devices, signals and flares, high performance rocket propellants, and gas generating compositions for various military, industrial, and commercial applications. This book will discuss many of these applications, but will focus mainly on the preparation of such compositions and their ultimate importance in our modern civilization.

2b. What makes pyrotechnic compositions what they are?

For most of you, you are probably already aware of what makes pyrotechnic compositions work; however, some readers may not be aware to any significant extent, so I will provide a brief yet simple tutorial on pyrotechnics. First of all, 99.9% of all pyrotechnic compositions have a fundamental characteristic to one another, and that fundamental characteristic is oxidizers, and reducing agents. Oxidizing agents and reducing agents go hand in hand to make pyrotechnic compositions work. Oxidizers are a classification of chemical compounds that contain an abundance of oxygen within the molecules of the oxidizing substance. This abundance of oxygen gives oxidizing agents specific physical properties, and makes them reactive towards reducing agents. Reducing agents are a class of chemical compound that do not necessarily contain oxygen, but contain atoms that are excited when ignited in the presence of oxidizing compounds. The excited atoms within reducing agents allow the reducing agents to become "oxidized" by the oxidizer, meaning the excited atoms, when ignited in the presence of oxidizing compounds, become oxidized, meaning they take up oxygen from the oxidizing agent and hence become "oxidized". When reducing agents take up oxygen from an oxidizing substance, the oxidizer itself becomes reduced as it looses its oxygen, and the reducing agent becomes oxidized as it gains oxygen. This strange process is called oxidation/reduction and is the foundation to the chemistry of pyrotechnic compositions. Note: reducing agents are sometimes called "combustion" agents, as many of them tend to be flammable. Lets look at some examples of oxidizing and reducing agents:

COMMON OXIDIZERS	COMMON REDUCERS
Sodium nitrate	Aluminum powder
Potassium nitrate	Magnesium powder/granules, flake
Potassium chlorate	Sulfur
Sodium perchlorate	Charcoal
Sodium peroxide	Sugar
Potassium permanganate	Antimony sulfide
Potassium dichromate	Zinc phosphide

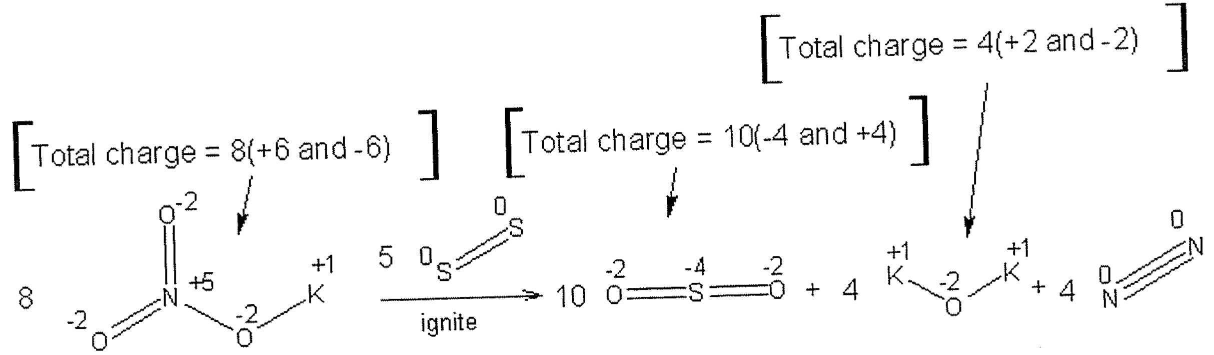
All of the oxidizing agents contain an abundance of oxygen, making these compounds extra reactive. Notice how the reducing agents listed in the table have no oxygen. Now, just because they don't contain oxygen does not make them reducing agents, but what does, is the fact that all of the substances contain atoms that are easily oxidized, meaning the atoms prefer to be in a higher state of energy. To understand this higher state of energy, you must understand the various energies in the atoms themselves. Lets look at the energies of sodium chlorate, and aluminum powder. The central atom in sodium chlorate is a chlorine atom. This chlorine atom has an oxidation state of +5, making it more reactive then most typical compounds. When we look at aluminum, the aluminum is in its ground state, and is easily oxidized, meaning it wants to be in a higher state of energy. To better explain this look at the following diagram.



Notice in the above diagram how the chlorine atom on the left is in the +5 oxidation state, and after the reaction (on the right side of the arrow), we see the chlorine atom is in the –1 oxidation state. So what does this mean? Well because the chlorine atom was in a +5 oxidation state, it wants to be in its –1 oxidation state, therefore, any compound that contains a +5 chlorine atom will be more reactive then most compounds, and hence makes the compound an oxidizing agent, i.e., sodium chlorate. Now during the reaction, the +5 chlorine atom gains electrons from the oxygen atoms forming chlorine and oxygen. This chlorine reacts directly with the sodium forming sodium chloride and the oxygen reacts with the aluminum, forming aluminum oxide. The reason why the oxygen reacts with the aluminum, and not with the sodium is because the oxygen has a higher affinity towards the aluminum then the chlorine, and so then the chlorine has only the sodium to bond to. The entire reaction can take only seconds in its entirety, and the energy released is given off as products, light, heat, and fire. The latter is what is used in pyrotechnics to achieve a specific effect, as seen in fireworks.

Most oxidizing agents give up oxygen when ignited or heated. *Note: In most pyrotechnic compositions, the oxidizer is the source of oxygen, and this same oxygen is what "burns" the reducing agent producing light, heat, and fire.* When this oxygen is liberated, it is in a highly reactive state, and bonds immediately and violently with the reducing agent. If we look at the burning of a piece of wood for example, the oxidizer, being the oxygen from the air, combines with products from the reducing agent, being wood. In all oxidation and reduction examples, matter is neither created nor destroyed, but simply converted from one form to the next. In the reaction of sodium chlorate with aluminum powder, the reactants are sodium chlorate and aluminum, and the products of the reaction are sodium chloride (NaCl) and aluminum oxide (Al2O3). In the reaction of oxygen with wood, we get carbon, carbon dioxide, carbon monoxide, water, nitrogen, and large cyclic hydrocarbons, which we see as "smoke". In the reaction of sodium chlorate with aluminum, we see a white smoke, which is composed of the aluminum oxide, and we see a residue left behind after the reaction, which is the sodium chloride. Also, a major product in combustion is light, heat, and of coarse, fire.

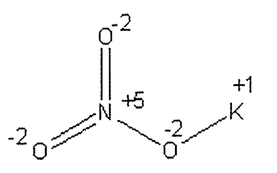
If your still having trouble understating oxidation and reduction, lets look at one more example. The following diagram shows potassium nitrate reacting with sulfur to yield the products of sulfur dioxide, potassium oxide, and nitrogen gas. In the reaction, the nitrogen within the potassium nitrate is in the +5 oxidation state; however it does not want to be at this state, so it is active and waits to react with a reducing agent. When the potassium nitrate reacts with the sulfur, the central nitrogen in the +5 state gains electrons from the oxygens', liberating nitrogen and oxygen. The oxygen then bonds with the sulfur and potassium forming sulfur dioxide and potassium oxide. Now, why doesn't the nitrogen bond with the potassium like the chlorine with the sodium in the previous example? The answer is because nitrogen is much more inert then chlorine and likes to bond with itself forming diatomic nitrogen. Before you get confused, remember that these characteristics are residing in general chemistry, which a whole new ball game in itself.

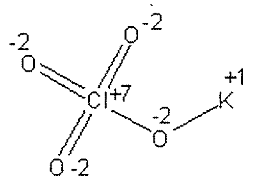

Total charge = 4(+2 and -2)
Total charge = 8(+6 and -6)
Total charge = 10(-4 and +4)
ignite

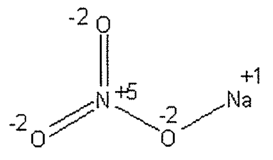
Lets now examine the oxidation states of the various atoms found in this book. These oxidation states are getting into general chemistry, which is something I want to avoid, but I feel that a quick lesson in the oxidation states of simple atoms will better explain the chemistry involved during combustion of the pyrotechnic compounds. Lets look at the following table:

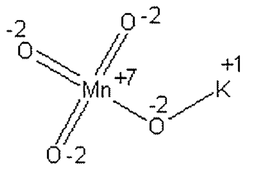
Oxidizing agent	Oxidation number of the central atom thereof
Sodium nitrate - $NaNO_3$	Nitrogen = +5 (wants to be in the 0 state)
Potassium nitrate - KNO_3	Nitrogen = +5 (wants to be in the 0 state)
Potassium chlorate - $KClO_3$	Chlorine = +5 (wants to be in the –1 state)
Potassium perchlorate - $KClO_4$	Chlorine = +7 (really wants to be in –1 state)
Potassium permanganate - $KMnO_4$	Manganese = +7 (really wants to be in the +2, or +4 state)
Potassium dichromate - $K_2Cr_2O_7$	Chromium = +6 (really wants to be in 0, or +2 state)

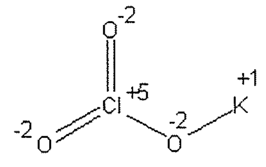
Now, look at the following diagram to get a rough idea of the oxidation states in each central atom in the corresponding oxidizing agent.

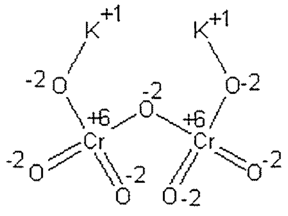

Potassium nitrate


Potassium perchlorate

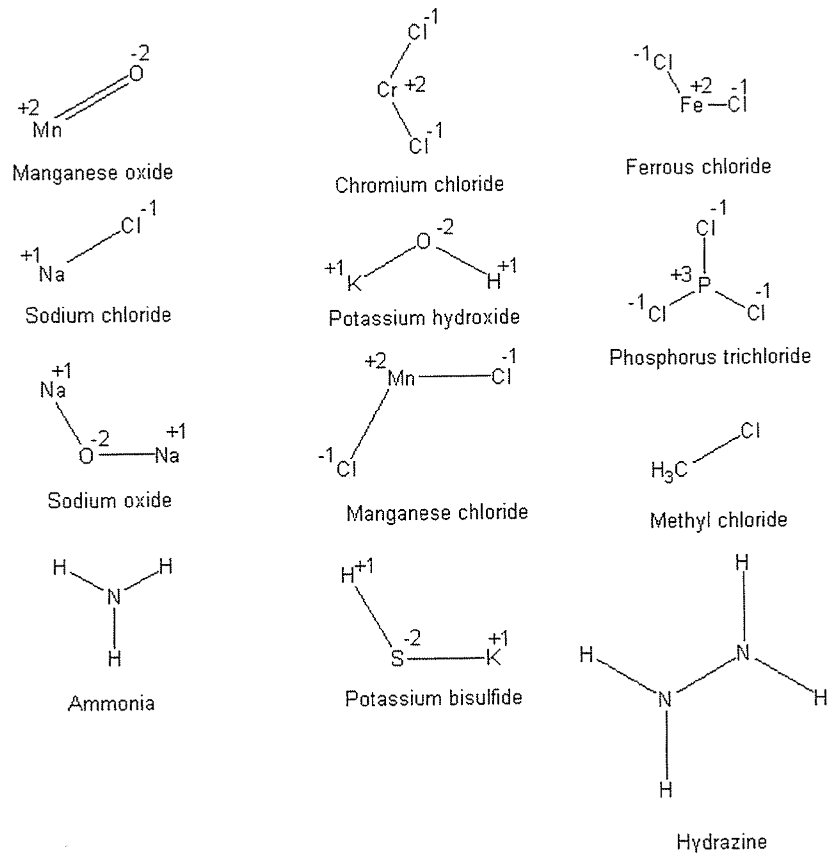

Sodium nitrate


Potassium permanganate


Potassium chlorate

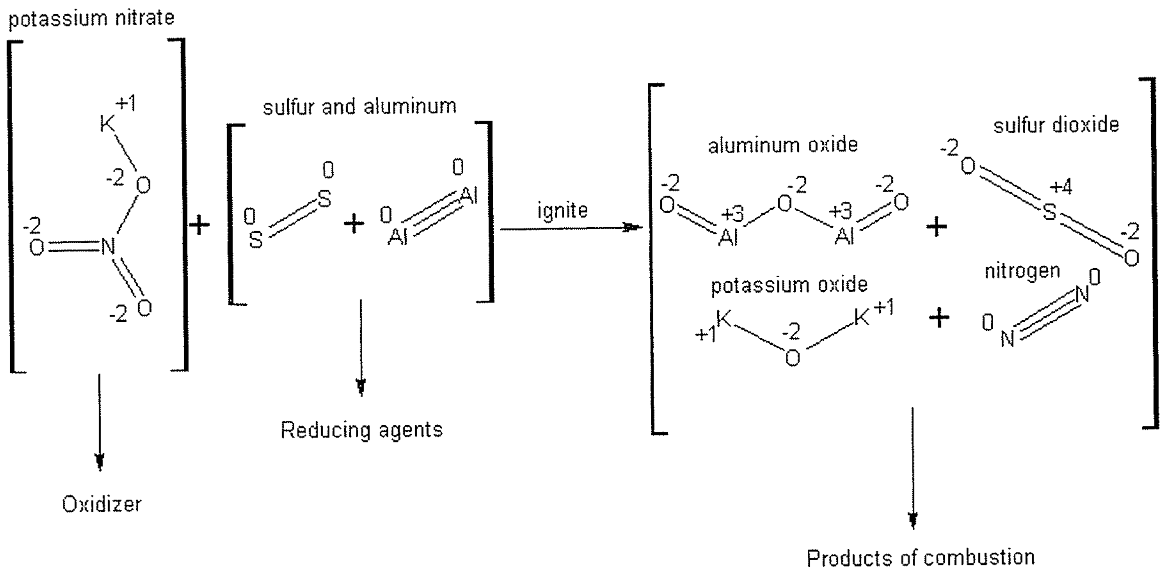

Potassium dichromate

If you notice, all molecules listed above have an equal number of positive charges, and an equal number of negative charges. These charges are perfectly balanced and in a state of equilibrium. Many of these compounds that are in equilibrium are called "inorganic" compounds, as they contain charged particles of positive and negative. All oxidizing agents contain central atoms in a high oxidation state; to get an idea of what lower oxidation states would be, look at the following diagram of stable, and ***non-oxidizing agents***.


Manganese oxide
Chromium chloride
Ferrous chloride
Sodium chloride
Potassium hydroxide
Phosphorus trichloride
Sodium oxide
Manganese chloride
Methyl chloride
Ammonia
Potassium bisulfide
Hydrazine

If you notice in the diagram, ammonia, hydrazine, and methyl chloride have no oxidation states written next to them. The reason is because these molecules are covalent. Now, what does this mean? Well, lets not worry about that as covalent molecules differ from inorganic molecules, and I'm trying to confuse you!! Remember that most oxidizing agents are inorganic molecules, containing positive and negative charges.

Now, as stated earlier, when an oxidizing agent "oxidizes" a reducing agent, the reducing agent becomes "oxidized", and then the oxidizing agent becomes "reduced". If this is confusing, look at the following diagram and try to understand this principle.

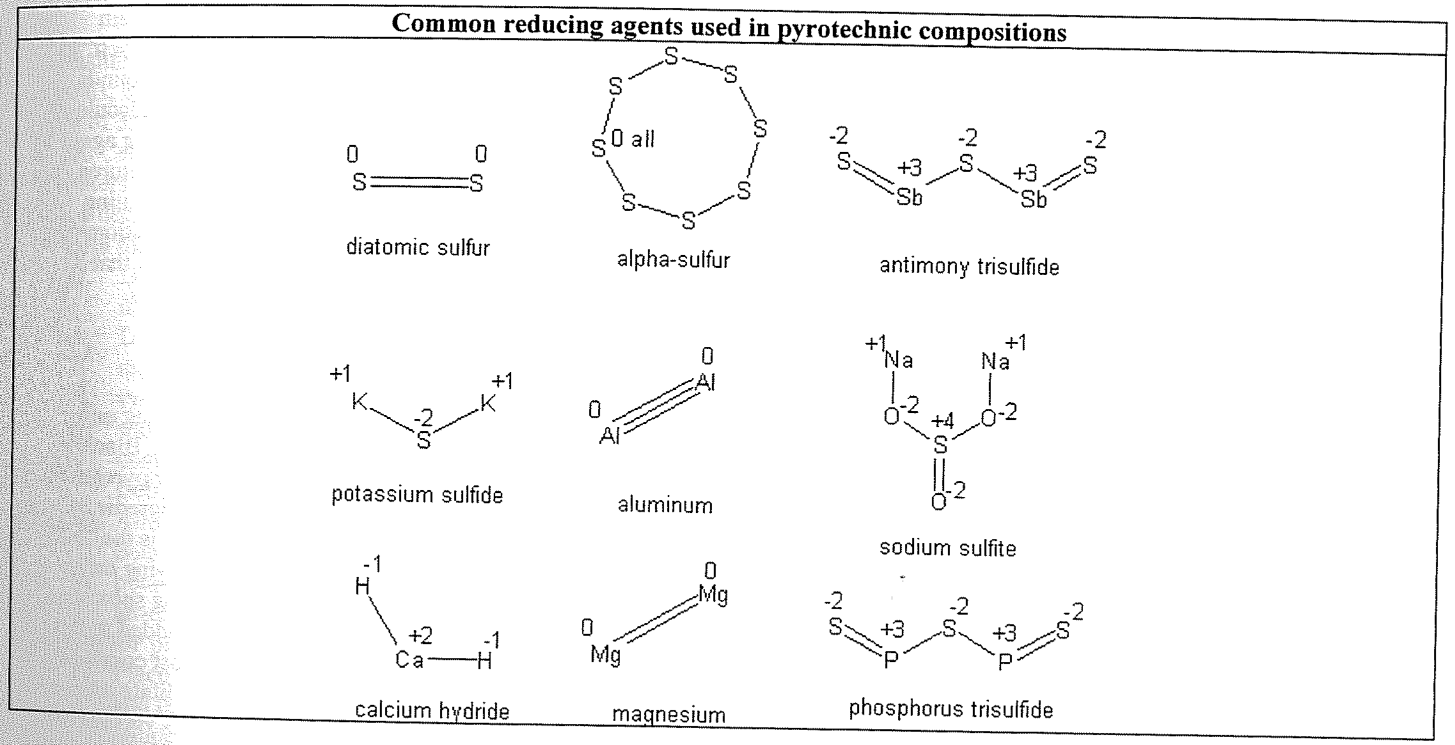

potassium nitrate
sulfur and aluminum
ignite
aluminum oxide
sulfur dioxide
potassium oxide
nitrogen
Oxidizer
Reducing agents
Products of combustion

In the above diagram, potassium nitrate is the oxidizer, and sulfur and aluminum are the reducing agents. During the combustion process, the potassium nitrate oxidizes the sulfur and the aluminum forming products. During the oxidation process, the potassium nitrate is "reduced" to potassium oxide, nitrogen, and aluminum oxide. At the same time, the sulfur is "oxidized" to sulfur dioxide,

and the aluminum is "oxidized" to the aluminum oxide. Remember that nitrogen tends to like being by itself so it evolves as nitrogen gas, or diatomic nitrogen seen as N_2. This process of oxidation and reduction is the bases behind 99.9% of all pyrotechnics. As mentioned earlier, other products in the oxidation and reduction process include light and fire. These two elements are the bases for fireworks, and all the beautiful colors and effects produced by such pyrotechnic mixtures. The color of the fire and light produced during an oxidation/reduction process depends on the oxidizing agent and reducing agents involved in the reaction. For example, barium oxidizing salts produce green colors, and strontium oxidizing salts produce brilliant reddish colors during the combustion process.

3a. The nature of reducing agents verse oxidizing agents

So now lets discuss the nature of reducing agents, and their importance in pyrotechnic compositions. As previously discussed, reducing agents contain atoms that are easily oxidized. These atoms exists in oxidation states that are not preferred by the reducing agent. So why do these compounds even exist if they contain atoms that want to be in different states to begin with? This is a good question, and takes us to the fact of chemistry and its reactions. As we cannot discuss all these reactions, because this is not a chemistry book, we can talk a little about the reducing agents used in pyrotechnics. Lets look at the following diagram.


Common reducing agents used in pyrotechnic compositions
diatomic sulfur
alpha-sulfur
0 all
antimony trisulfide
potassium sulfide
aluminum
sodium sulfite
calcium hydride
magnesium
phosphorus trisulfide

In the above illustration we see that antimony trisulfide and phosphorus trisulfide have antimony and phosphorus atoms in the +3 oxidations state. These two elements prefer to be in a +5 oxidation state where they are most comfortable. Therefore, antimony trisulfide and phosphorus trisulfide are reducing agents, as their central atoms, i.e., antimony and phosphorus want be in a higher state. Now, as previously mentioned, if antimony and phosphorus prefer to be in a higher state, why do they even exits in the states shown in antimony and phosphorus trisulfide? Well, to better explain this, is to understand the nature of chemical reactions. Not all elements end up in their desired states during a chemical reaction. In fact, each chemical reaction is unique in its own light. Some chemical reactions put the atoms in different states, but not necessarily the exact state they feel most comfortable. At the same time, other chemical reactions, specifically those of combustion, found in ignition of pyrotechnic mixtures, push these atoms into their desired states immediately without any interference. What oxidation state each atom has, it directly proportional to the reactants involved and the reaction conditions. In pyrotechnic reactions, all the atoms involved enter the exact states they feel most comfortable in, because during the ignition of the pyrotechnic composition, allot of energy is released in the form of heat. It's this heat that pushes the atoms into their desired states.

4a. Deflagration and the process of combustion

Now is the time to start talking about what the actual process of the combustion of a pyrotechnic mixture is called. This process is called "deflagration". Deflagration is the process of rapid and violent combustion. Many pyrotechnic mixtures undergo this type of combustion when they are ignited. As discussed earlier, when an oxidizer in a mixture reacts with a reducing agent, oxygen is liberated from the oxidizer and it then reacts with the reducing agent. The rate of reaction is very fast, and this rapid reaction rate is what causes the deflagration process. Deflagration is crucial in the pyrotechnics arena, and is ultimately the reason why many pyrotechnic mixtures form beautiful colors, sparks, flames, ect, upon ignition. Without the process of deflagration, rockets, gun propellants, stars, cones, fountains, and many other pyrotechnic devices would not function properly as their rapid combustion is what gives them the energy to perform as pyrotechnics. In all pyrotechnic mixtures/devices, it's the deflagration process that produces the pressures needed for the pyro concoctions to work properly. These pressures can be used to propel rockets, provide energy for flares and signals, allow military personnel to lay down smoke screens, and/or propel solid projectiles, such as bullets for security and protection. Now propulsion of bullets may seem like a negative use for the deflagration process, but all deflagration processes go hand in hand, and are equal. For example, when we take a sample of black powder, and ignite it in an open space, it flares up and burns out quite quickly. If we take this black powder, and instead of igniting it in the open, we insert it into an open end of a tube, such as a gun barrel, and then place a ball or similar projectile therein, and ignite the powder, a loud bang results, and the ball or projectile goes flying down range. In both cases the deflagration process is the result of the rapid combustion of the pyrotechnic mixture. When most pyrotechnic compositions are ignited in open spaces, they burn quickly, and when they are ignited within enclosed areas, they burn even quicker, but in both cases the deflagrations equal in energy, but the pressures can vary. Some mixtures however, may not burn as fast, or as long as other mixtures, but in any sense, the deflagration process is the driving force behind the energy and the process.

5a. Non-oxidizing pyrotechnics, and their nature

It should be noted, that not all pyrotechnic compositions contain straight oxidizers and reducing agents. Some mixtures contain compounds that undergo a process called "self deflagration". Self-deflagration is when a compound supplies oxygen from itself, to itself. Self-deflagrating compounds are nitrocellulose, nitro starch, picrates salts, picramates, ADN, and other similar compounds. These molecules are capable of self-combustion, and upon ignition, they will supply their own oxygen to the rest of the molecule to support combustion. Compounds like nitrocellulose can be ignited by themselves, and do not require an oxidizer or reducing agent to complete the deflagrating process. Self-deflagrating compounds have the advantage over conventional oxidizer/reducer mixtures, in that self-deflagrating compositions tend to burn cleaner and leave behind fewer residues. The reason is because self-deflagrating compositions tend to produce higher gas volumes with limited residue. Nitrocellulose and related self-deflagrating compositions decompose almost entirely into gas leaving very little residue. On the other end, potassium nitrate compositions, especially that of black powder, leave behind significant residue upon ignition. These posses problems especially when dealing with firearms.

6a. Methods of forming pyrotechnic compositions

In some cases, the desired pyrotechnic composition can be readily formed by simply blending the ingredients together using any desired means. However, some times pyrotechnic compositions can only be formed when they are mixed in special ways. Black powder for example, cannot simply be made by just blending the ingredients together. To form black powder and similar pyrotechnic mixtures, the ingredients of the mixtures need to be blended very thoroughly to form a uniform mixture. To mix these ingredients very thoroughly requires special mixing devices. There are two main types of mixing apparatus available. The most common is the "ball mill", and "vertical mixer". A ball mill is a simple device utilizing a central container, similar to an empty coffee can laying on its side, and a small electric motor. The electric motor rotates the coffee can utilizing a fan belt or similar band. The rotating speed can very from 50 to 1500 RPM, depending on the type of mixing desired. In some cases, steel balls, or other materials are added to the mill, so they produce a high surface area of blending and pulverizing when the can rotates. Ball mills are one of the most common apparatus used to form pyrotechnic compositions, such as black powder. Also, in other cases, a solvent is added to facilitate proper pulverization and coheasion with maximum surface area. The second most common type of mixer is a vertical mixer. A vertical mixer is very similar to a household blender, utilizing a large surfaced area plastic stir blade, similar to a bread dough mixer. All ingredients are added when necessary, and the mixture is usually blended in the presence of a solvent to facilitate maximum surface area. Now, these two types of mixers may have different names, but their method of work is the same. You can find out more about these mixing devices by conducting a search on the Internet.

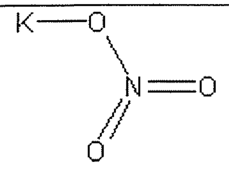
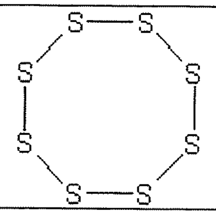
7a. How to use this manual

In the beginning of each section, there is a brief examination of the various chemicals used in the preparation of the pyrotechnic compositions. Each section is then followed by the actual procedures, which have all been written to explain how the given mixture is obtained. You will notice as you read, that many of the procedures are very similar in nature. At the end of each procedure, a percentage is given to show the amount of each substance in the given mixture. At the end of each percentage entry, you will notice that it sometimes say, "mixed balance", "mixed residual balance", ect. What this means is the percentage have been cut-off at the hundredth mark of each decimal place to forgo extensive numbering. For example look at procedure "05-02-025A: Friction sensitive composition for use in matches". In the procedure, it calls for 160 grams of animal glue, 450 grams of potassium chlorate, 210 grams of powdered glass, 40 grams of plaster of Paris powder, 40 grams of zinc oxide, 20 grams of" whiting", 30 grams flours of sulfur, and 100 grams of red phosphorus. The total amount of solids used is 1050 grams. Therefore the "exact" percentages would be written as 42.8571428571% potassium chlorate, 20% powdered glass, 15.2380952381% animal glue, ect., ect. However, to save time, we would write the percentages as 42.85% potassium chlorate, 20% powdered glass, 15.23% animal glue, 9.52% red phosphorus, 3.8% plaster of Paris, 3.8% zinc oxide, 2.85% sulfur, 1.9% whiting, and 0.05% residue, or "mixed balance"

1. Black Powder

Section 1: Black Powder

Chemicals used in this section

1. Potassium nitrate		**2. Sulfur**
		
Potassium nitrate forms colorless transparent or white crystals, or a crystalline powder. The salt has a melting point of 333 Celsius, and begins to decompose when heated to 400 Celsius. Its solubility in water is 1 gram in 2.8 milliliters of water at 25 Celsius. The salt dissolves in water with a decrease in temperature.		Sulfur forms a yellow odorless powder. The dry solid is flammable and burns forming choking fumes of sulfur dioxide. The solid is insoluble in water and most solvents, but readily soluble in liquid ammonia.
Process for preparation 1: 1. Dissolve 100 grams of sodium nitrate into 110 milliliters of water at room temperature. 2. Dissolve 88 grams of potassium chloride into 252 milliliters of water at room temperature. 3. Pour the potassium chloride solution into the sodium nitrate solution, and then place the combined mixture into an ice bath, and chill it to 0 Celsius. 4. Allow the mixture to chill at 0 Celsius for about 1 hour. Thereafter, filter-off the precipitated potassium nitrate crystals, and then vacuum dry or air-dry the filtered-off potassium nitrate crystals. **Process for preparation 2:** 1. Place 130 grams of 70% nitric acid into a flask, and then add in 250 milliliters of water at room temperature to dilute the acid. 2. Slowly add, in small portions at a time, 89 grams of potassium hydroxide, or 110 grams of potassium carbonate, over a period of 1 hour. 3. After the addition, boil the mixture to remove the water, and recover the potassium nitrate, or use any desired means.		Sulfur is obtained in pure form from many different sources
3. Charcoal		
Charcoal various in degree and quality, but normal charcoal usually exists of any desired soft wood, which is roasted in a kiln or suitable device. The roasting, otherwise called destructive distillation, produces charcoal, and by-products such as methanol, acetic acid, and various hydrocarbon gases including methane, ethane, and propylene.		

- Black Powder Compositions in this section -

1. 01-01-001A: Black Powder Composition 1 (standard black powder): *75% potassium nitrate, 15% charcoal, 10% sulfur*	**2. 01-01-001B: Black Powder Composition 2 (Chinese Grade, 10th Century):** *67% potassium nitrate, 21.99% charcoal, 10.99% sulfur, 0.01% sulfides, 0.01% arsenic*
3. 01-01-001C: Black Powder Composition 3 (Whitehorne	**4. 01-01-001D: Black Powder Composition 4 (English royal**

black powder, 15th century Europe): *50% potassium nitrate, 33.33% charcoal, 16.61% sulfur, 0.06% impurities*	**black powder, 17th century England):** *50% potassium nitrate, 33.33% charcoal, 16.61% sulfur, 0.06% impurities*
5. 01-01-001E: Black Powder Composition 4 (English royal black powder, 17th century England): *75% potassium nitrate, 12.5% charcoal, 12.5% sulfur*	**6. 01-01-001F: Black Powder Composition 5 (French specific black powder, 17th century):** *78% potassium nitrate, 19% charcoal, 3% sulfur*
7. 01-01-001G: Black Powder Composition 6 (American black powder, 19th century: *72.9% potassium nitrate, 15.62% charcoal, 11.45% sulfur, 0.03% impurities*	**8. 01-01-001H: Standard black powder (precipitation method):** *75% potassium nitrate, 15% charcoal, 10% sulfur*
9. 01-01-001I: Standard pyrotechnics Black Powder (PGI optimum, fireworks standard): *74% potassium nitrate, 14% charcoal, 12% sulfur*	**10. 01-01-002A: 19th-century American black powder composition:** *74% potassium nitrate, 14% charcoal, 12% sulfur*
11. 01-01-003A: "Reduced wastage" black powder composition (burns more evenly with ejection of fewer unburned particles): *74.8% potassium nitrate, 13.2% charcoal, 11.8% sulfur, 0.176% impurities, 0.024% paraffin*	**12. 01-01-004A: Standard black powder composition (precipitation method 2):** *75% potassium nitrate, 14.6% charcoal, 10.4% sulfur*
13. 01-01-005A: Standard "sporting powder" black powder composition (basic tumbling method): *74% potassium nitrate, 15.6% charcoal, 10.4% sulfur*	**14. 01-01-006A: Black powder composition:** *74% potassium nitrate, 15.6% charcoal, 10.4% sulfur*
15. 01-01-007A: Black powder composition: *75% potassium nitrate, 15% charcoal, 10% sulfur*	**16. 01-01-008A: Black powder composition:** *76.27% potassium nitrate, 13.55% charcoal, 10.16% sulfur, 0.02% mixed balance*
17. 01-01-009A: Black powder composition: *72.72% potassium nitrate, 17.27% charcoal, 10% sulfur, 0.01% mixed residue*	**18. 01-01-010A: Black powder composition:** *74.74% potassium nitrate, 15.15% charcoal, 10.10% sulfur, 0.01% mixed residual balance*
19. 01-01-011A: Black powder composition: *75% potassium nitrate, 15% charcoal, 10% sulfur*	

01-01-001A: Black Powder Composition 1 (standard black powder):
Into a standard tumbler machine, place ***225 grams of potassium nitrate*** of at least 98% purity, followed by ***45 grams of charcoal***, and then followed by ***30 grams of sulfur*** of a purity of at least 99%. Then add in 50 milliliters of 95% ethyl alcohol—denatured alcohol can be used. Then add in about 100 grams of steel shot. The steel shot should be of 4 to 5 millimeters in diameter, and should be of stainless steel—no rust, or dirty shot. Note: Teflon coated steel balls are preferred. Thereafter, turn on the tumbler machine, and allow the mixture to churn for several hours at 180 RPM. Note: the charcoal may vary, but usually consists of charcoal made by the pyrolysis of willow trees, grapevines, pines, or laurel trees. Although wood charcoal can vary in chemical composition and texture, either form of wood charcoal is satisfactory, but only from soft woods. After rotating the mixture for several hours, turn off the machine, and then remove the contents within the drum. Place these contents onto a shallow pan, and allow the mixture to thoroughly air-dry for 2 to 3 days. Note: After 2 or 3 days, the black powder should have no odor of solvent. After the black powder has thoroughly dried, what you do with it now is up to you. For example, if you wish to make grains for firearms, the black powder should be carefully broken up, and then passed through any selected sieves or screens to separate out the different grain sizes. A Black powder with grains of 0.50 to 1.5 millimeters in diameter is best suited for firearms. A Black powder with grains of 2 to 3.5 millimeters is best suited for cannons. If you wish use black powder in finely divided form, place your dried mixture into a clean rotating drum, and then ball mill it just like before, with clean steel shot until it's thoroughly ground. This finely divided black powder can be used for any suitable operation where black powder is used.
Burn rate: Depends on grain size
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***75% potassium nitrate, 15% charcoal, 10% sulfur***
Classification: Deflagrating explosive (classified as propellant).

01-01-001B: Black Powder Composition 2 (Chinese Grade, 10th Century):
Into a clay or wood drum, place ***188 grams of Chinese saltpeter***, followed by ***66 grams of charcoal***, and then followed by ***33 grams of flours of sulfur***. Then add in 50 milliliters of a 25% saltpeter solution. Note: this saltpeter solution would have contained traces of sulfide minerals and arsenic. Then add in about 75 grams of limestone or marble balls of 10 to 15 millimeters in diameter. The limestone or marble balls should be pre-coated with charcoal, sulfide ore dust, or with a low volatile resin. Thereafter, rotate the drum vigorously back and forth, like a washing machine, for several hours to form a uniform pasty mixture. Note: the charcoal may vary, and the exact charcoal used by Chinese alchemists is not fully known, but probably consists of any soft wood from local areas in central China. After rotating the mixture for several hours, remove the contents from the drum, and place it onto a shallow clay pan or spread out over leaves, and allow the mixture to thoroughly air-dry for 4 to 5 days. Note: After 4 or 5 days, the black powder should be completely dry. After the black powder has thoroughly dried, it needs to be milled in the same manner as before but dry milled using clean pre-coated limestone or marble balls of similar diameter for several hours to form a uniform finely divided powder. This finely divided black powder can be used for any suitable operation where black powder is used. Note: this brand of black powder may still exist in some products of Chinese fireworks.
Burn rate: Rapid
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***67% potassium nitrate, 21.99% charcoal, 10.99% sulfur, 0.01% sulfides, 0.01% arsenic***
Note: will also contain traces of limestone, calcium carbonate, sodium chloride, and resin
Classification: Deflagrating explosive (classified as propellant).

01-01-001C: Black Powder Composition 3 (Whitehorne black powder, 15th century Europe):
Into a bronze or lead drum or barrel, place ***150 grams of potassium nitrate*** (recrystallized from boiling water), then add in ***99.9 grams of charcoal (from rye straw)***, followed by ***49.8 grams of flours of sulfur***. Thereafter, add in 15 milliliters of cold water, followed by about 75 grams of copper or lead shot of 6 to 9 millimeters in diameter. Thereafter, rotate the bronze or lead drum back and forth vigorously, like a washing machine, for several hours. After rotating the mixture for several hours, remove the contents within the drum. Then place these contents onto a shallow pan, and allow the mixture to thoroughly air-dry for several days. After the black powder has thoroughly dried, it needs to be milled for several hours in an identical manner using clean copper or lead shot in a clean bronze or lead drum or barrel. Thereafter, the milled black powder can be passed through various sizes of sieves to separate out various grain sizes. After this, the grains are ready for use. Black powder grains of 0.50 to 1.5 millimeter in diameter are best suited for firearms. Black powder grains of 2 to 3.5 millimeters are best suited for mortars, and grains of 3 to 6 millimeters are best for

cannons. If you wish to use black powder in finely divided form, place your dried mixture into a clean rotating drum, and then ball mill it just like before, with clean steel shot until it's thoroughly ground. This finely divided black powder can be used for any suitable operation where black powder is used.

Burn rate: Depends on grain size
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***50% potassium nitrate, 33.33% charcoal, 16.61% sulfur, 0.06% impurities***
Classification: Deflagrating explosive (classified as propellant).

01-01-001D: Black Powder Composition 4 (English royal black powder, 17th century England):

Into a steel drum or barrel, place ***300 grams of potassium nitrate*** (recrystallized from boiling water), followed by ***50 grams of soft wood charcoal or rye straw charcoal***, followed by ***50 grams of flours of sulfur***. Thereafter, add in 20 milliliters of mineral water, followed by about 100 grams of iron or lead shot of 6 to 8 millimeters in diameter. Thereafter, rotate the steel drum or barrel back and forth vigorously, like a washing machine, for several hours. After rotating the mixture for several hours, remove the contents within the drum. Then place these contents onto a shallow pan (minus the iron or lead shot), and allow the mixture to thoroughly air-dry for several days. After the black powder has thoroughly dried, it can be broken up into pieces and then passed through a sieve with 1.5 millimeter holes for firearms, or 3 millimeter holes for mortars, or 7 millimeter holes for cannons. For forming powder for time fuse and for blasting powders, the dry mixture needs to be milled for several hours in an identical manner using clean iron or lead shot in a clean steel drum or barrel. This finely divided black powder can be used for any suitable operation where black powder is used.

Burn rate: Depends on grain size
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***75% potassium nitrate, 12.5% charcoal, 12.5% sulfur***
Classification: Deflagrating explosive (classified as propellant).

01-01-001E: Black Powder Composition 5 (French specific black powder, 17th century):

Into a hard wood barrel or drum, place ***312 grams of potassium nitrate***, followed by ***76 grams of rye straw charcoal***, followed by ***12 grams of flours of sulfur***. Thereafter, add in 20 milliliters of water, followed by about 100 grams of iron or lead shot of 4 to 7 millimeters in diameter. Thereafter, as usual, rotate the wood drum or barrel back and forth vigorously, like a washing machine, for several hours. After rotating the mixture for several hours, remove the contents within the drum. Then place these contents onto a shallow pan (minus the iron or lead shot), and allow the mixture to thoroughly air-dry for several days. After the black powder has thoroughly dried, it can be broken up into pieces and then passed through a sieve with 1.2 to 1.5 millimeter holes for firearms, or 2.5 to 4 millimeter holes for mortars, or 5.2 to 12 millimeter holes for cannons. For forming powder for time fuse and for blasting powders, the dry mixture needs to be milled for several hours in an identical manner using clean iron or lead shot in a clean hard wood drum or iron drum or barrel. This finely divided black powder can be used for any suitable operation where black powder is used.

Burn rate: Depends on grain size (very good for small bore firearms).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***78% potassium nitrate, 19% charcoal, 3% sulfur***
Classification: Deflagrating explosive (classified as propellant).

01-01-001F: Black Powder Composition 6 (American black powder, 19th century):

Into a galvanized iron barrel or drum, place ***280 grams of precipitated potassium nitrate***, i.e., recrystallized from boiling water, followed by ***60 grams of soft wood charcoal***, followed by ***44 grams of flours of sulfur***. Thereafter, add in 15 milliliters of water, followed by about 75 grams of steel shot of 4 to 6 millimeters in diameter. Thereafter, rotate the steel drum or barrel for several hours at 150 RPM. After rotating the mixture for several hours, remove the contents within the drum. Then place these contents onto a shallow pan (minus the shot), and allow the mixture to thoroughly air-dry for several days. After the black powder has thoroughly dried, it can be broken up into pieces and then passed through a sieve with 1.0 to 1.6 millimeter holes for firearms, or 2.0 to 4.1

millimeter holes for mortars, or 5.0 to 12.6 millimeter holes for cannons. For forming powder for time fuse and for blasting powders, the dry mixture needs to be milled for several hours in an identical manner using clean steel or lead shot in a clean steel barrel or drum. This finely divided black powder can be used for any suitable operation where black powder is used.

Burn rate: Depends on grain size (very good for small bore firearms).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***72.9% potassium nitrate, 15.62% charcoal, 11.45% sulfur, 0.03% impurities***
Classification: Deflagrating explosive (classified as propellant).

01-01-001G: Standard black powder (precipitation method):

Place ***45 grams of standard wood charcoal*** and ***30 grams of flours of sulfur*** into a ball mill, and then throw in about 25 grams of steel shot of 4 to 5 millimeters in diameter. Thereafter, tumble the contents for about 1 or 2 hours at 150 to 180 RPM. After the mixing process, remove the charcoal/sulfur mixture from the drum. Now, into a large suitable beaker, glass or stainless steel container, place 650 milliliters of water, followed by ***225 grams of potassium nitrate***. Note: your container should be big enough so that after adding in the water and potassium nitrate, your container is just under half full. Thereafter, boil the water and allow the potassium nitrate to dissolve. Once the potassium nitrate dissolves, add in the charcoal/sulfur mixture previously prepared, and then continue boiling the entire mixture while rapidly stirring for about 1 hour. Note: during the boiling process, water will obviously be lost due to evaporation; as a result, never mind this water loss. After 1 hour, remove your heat source, and allow the total mixture to cool to about 70 or 80 degrees Celsius. During this cool down time, rapidly stir the entire blackish, mucky mixture. When the temperature of the mixture reaches 70 to 80 Celsius, quickly add to it, 600 milliliters of ice-cold isopropyl alcohol, or 700 milliliters of ice-cold denatured alcohol. Now, quickly place this mixture (your container) into an ice bath, and chill the contents of your mixture to 0 Celsius. Allow the mixture to stand at this temperature for at least 30 minutes. During the whole time, rapidly stir the black mucky mixture. After allowing the mixture to chill for at least 30 minutes, filter the mixture to remove the insoluble materials. Now, you can use any of two methods of filtration, i.e., gravity filtration or vacuum filtration. If using gravity filtration, it will take some time to recover the black powder, so vacuum filtration is recommended. If using vacuum filtration, suck the black powder dry. If you used gravity filtration, once your black powder has been removed, recover the pasty black powder material from the filter paper, and place it onto a shallow pan and spread it out, and allow it to air-dry until completely dry. Either way, once your black powder has been recovered and dried, it can be crushed up to make various sizes of grains.

Burn rate: Depends on grain size
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***75% potassium nitrate, 15% charcoal, 10% sulfur***
Classification: Deflagrating explosive (classified as propellant).

01-01-001H: Standard pyrotechnics Black Powder (PGI optimum, fireworks standard):

Into a standard heated tumbler machine, i.e., ball mill, place ***296 grams of potassium nitrate*** of at least 98% purity, followed by ***56 grams of willow tree, grapevine, pine, or laurel tree charcoal***, and then followed by ***48 grams of sulfur*** of a purity of at least 99%. Then add in 75 milliliters of 95% ethyl alcohol, or denatured alcohol. Thereafter, add in about 100 grams of steel shot of 4 to 5 millimeters in diameter. Then, turn on the tumbler machine, and allow the mixture to churn for several hours at 180 RPM and a temperature of about 40 Celsius. After rotating the mixture for several hours, turn off the machine, and then remove the contents within the drum. Place these contents onto a shallow pan, and allow the mixture to thoroughly air-dry for 2 to 3 days. Note: After 2 or 3 days, the black powder should have no odor of solvent. After the black powder has thoroughly dried, you can do several things with it. For example, if you wish to make grains for firing aerial display shells, the dried black powder mixture need to be broken up, and then shaken through sieves with 3.5 to 5 millimeter holes. For use in time fuse, or firecrackers, the dried black powder mixture should be placed in a clean rotating drum, and then ball milled with clean steel shot until it's thoroughly ground. This finely divided black powder can be used for any suitable operation where black powder is used.

Burn rate: Depends on grain size (excellent for firing aerial display shells in fireworks).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.

Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***74% potassium nitrate, 14% charcoal, 12% sulfur***
Classification: Deflagrating explosive (classified as propellant).

01-01-002A: 19th-century American black powder composition:

Into a suitable iron, tin, steel, or bronze pot, place 2 liters of water followed by ***750 grams of potassium nitrate***, and the boil the solution using a wood fire, or steam bath. When the water begins to boil, gently stir in ***150 grams of charcoal***, followed by ***120 grams of flours of sulfur***, and then continue to boil the mixture. Note: the mixture should be continuously stirred using a wood spatula all through out the boiling process. Continue to boil the mixture until about 98% of the water has been evaporated, and only a pasty mass exists. When this point is achieved, remove the pot from the heat source, and allow its contents to cool to room temperature. Note: during this cool down period, continuously stir the pasty mixture with a wooden spatula. Once the mixture has cooled to room temperature, lay out the mixture out on a shallow pan and allow it to thoroughly dry. Once the mass is dry, it can then be pulverized into different grain sizes that can be separated using desired sieves or screens.
Burn rate: Depends on grain size (granules 1 to 12 millimeters are suitable for fire-arms, mortars, and cannons, and fine powder can be used as blasting agent).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***74% potassium nitrate, 14% charcoal, 12% sulfur***
Classification: Deflagrating explosive (classified as propellant).

01-01-003A: "Reduced wastage" black powder composition (burns more evenly with ejection of fewer un-burned particles):

Into a standard heated ball mill containing 250 grams of steel shot of 10 millimeters in diameter, place ***500 grams of potassium nitrate*** of at least 98% purity, followed by ***88.8 grams of willow tree, grapevine, pine, or laurel tree charcoal***, followed by ***79.3 grams of flours of sulfur,*** followed by ***166 milligrams of paraffin,*** and finally followed by 175 milliliters of 95% ethyl alcohol, or denatured alcohol. Thereafter, tumble the mixture for several hours at 200 RPM and a temperature of about 40 Celsius. After rotating the mixture for several hours, turn off the machine, and then remove the contents within the drum. Place these contents onto a shallow pan, and allow the mixture to thoroughly air-dry for 2 to 3 days. Note: After 2 or 3 days, the black powder should have no odor of solvent. After the black powder has thoroughly dried, you can do several things with it. You can pulverize it by breaking it up in a crucible and then separating the various grain sizes using the desired sieves, or you can pulverize it using a clean ball mill to form a uniform mixture.
Burn rate: Depends on grain size
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***74.8% potassium nitrate, 13.2% charcoal, 11.8% sulfur, 0.176% impurities, 0.024% paraffin,***
Classification: Deflagrating explosive (classified as propellant).
Use: Most suitable for use in cannons using 7 to 12 millimeter grains.

01-01-004A: Standard black powder composition (precipitation method 2):

Into a suitable beaker or container, place ***225 grams of potassium nitrate,*** followed by 225 milliliters of water. Then, heat the mixture to 80 Celsius with good stirring to make sure the potassium nitrate dissolves. Once the nitrate dissolves, quickly prepare a second mixture by adding 675 milliliters of 95% ethyl alcohol or denatured alcohol, followed by adding in ***31.2 grams of powdered sulfur***, and then followed by ***43.8 grams of regular powdered wood charcoal***, and then rapidly stir the entire mixture for about 30 minutes. During this 30 minute period, maintain the hot potassium nitrate solution at 80 Celsius with good stirring. After 30 minutes, place the alcohol mixture into an ice bath, and chill to 15 Celsius. Thereafter, slowly and gently add in the hot potassium nitrate solution while rapidly stirring the alcohol mixture. After the hot potassium nitrate solution has been added, continue to stir the mucky mass rapidly for about 1 hour. After 1 hour, filter the mixture using gravity filtration or preferably vacuum filtration to recover the insoluble mass. After the filtration process, place the filtered mass onto a shallow pan and allow it to dry at room temperature for several days or so. After this, the composition is ready to be used. To use, it can be beaten or pulverized and the various grain sizes then separated using the desired sieves or screens, or the mass can be pulverized by hand, and then pressed under high pressure (20,000 psi) into pellets of any desired size or shape, or the mass can be ball milled using steel shot of 5 to 10 millimeters in diameter to form a uniform mixture.
Burn rate: Depends on grain size.
Water resistance: Moderate.

Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: May cake on prolonged exposure to moisture.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***75% potassium nitrate, 14.6% charcoal, 10.4% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: Most suitable for use small arms weapons, and in fireworks.

01-01-005A: Standard "sporting powder" black powder composition (basic tumbling method):

Into a suitable ball mill, filled with 500 grams of heavy steel shot, place ***156 grams of soft wood charcoal***, followed by ***104 grams of flours of sulfur***. Thereafter, tumble the mixture a 400 RPM for about 3 hours. Thereafter, add in ***740 grams of potassium nitrate***, and then continue to tumble the mixture at 250 RPM for about 5 hours at room temperature. Thereafter, separate the tumbled mixture from the steel shot using any desired screen in the usual manner, and then place the tumbled separated mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 250 milliliters of ether. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a uniform paste. Thereafter, the mixture is ready for casting. To do so, the wet material should be pressed through any desired die cast machine, into spaghetti like strands of 2 to 3 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the spaghetti like strands should be cut into lengths of 3 to 5 millimeters. Finally, the grains should be cured in an oven at normal temperature. The cured grains can then be poured into shell casings for use in standard ammunition, or can be placed into baggies for use in canons or the like.
Burn rate: Typical.
Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Very low.
Explosive ability: Safe.
Percentage: ***74% potassium nitrate, 15.6% charcoal, 10.4% sulfur***
Classification: Deflagrating explosive (classified as propellant)
Use: May be used for small arms weapons, cannons, and fireworks.

01-01-006A: Black powder composition:

Into a suitable ball mill, filled with 250 grams of lead shot, place ***78 grams of soft wood charcoal***, followed by ***52 grams of flours of sulfur,*** and then followed by ***370 grams of potassium nitrate***. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Note: During the 2-hour mixing process, spray into the ball mill, in small portions at a time, 125 milliliters of cold water. After the 2-hour mixing period, the mixture is ready for extrusion. To do so, the material should be pressed through any desired die cast machine, into spaghetti like strands of 2 to 3 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the spaghetti like strands should be cut into lengths of 1.5 to 3 millimeters. Finally, the grains should be cured in an oven at normal temperature. The cured grains can then be poured into shell casings for use in standard ammunition, or can be placed into baggies for use in canons or the like. If desired, the final material can be thoroughly dried. And then pulverized in a separate mill to form a fine powder.
Burn rate: Typical.
Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Very low.
Explosive ability: None.
Percentage: ***74% potassium nitrate, 15.6% charcoal, 10.4% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used for small arms weapons, cannons, and fireworks.

01-01-007A: Black powder composition:

Into a suitable ball mill, or vertical mixer, containing 200 grams of aluminum shot, place ***375 grams of pre-dried potassium nitrate***, followed by ***75 grams of soft wood charcoal,*** and then followed by ***50 grams of flours of sulfur***. Thereafter, add in 175 milliliters of alcohol spirits of camphor, and then tumble the combined mixture at 350 RPM for about 1 hour. After the 1 hour tumbling process, the mixture is ready for extrusion. To do so, the material should be pressed through any desired die cast machine, or formed into grains using any desired method in the usual manner. The grains in any case, need to be cured in an oven at ordinary temperatures in the usual manner. The cured grains can then be placed loosely into shell casings for use in standard ammunition, or can be placed into baggies for use in canons or the like.
Burn rate: Typical.

Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Very low.
Explosive ability: None.
Percentage: ***75% potassium nitrate, 15% charcoal, 10% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used for small arms weapons, cannons, and fireworks.

01-01-008A: Black powder composition:
Into a suitable ball mill, or vertical mixer, containing 500 grams of steel shot, place ***450 grams of pre-dried potassium nitrate***, followed by ***80 grams of soft wood charcoal***, and then followed by ***60 grams of flours of sulfur***. Thereafter, add in 125 milliliters of 95% ethyl alcohol, and then tumble the mixture at 500 RPM for about 2 hours. After 2 hours, place the mixture into a suitable vacuum apparatus, and remove the ethyl alcohol under mild vacuum. Thereafter, the mixture is ready for use. To do so, the material should be pressed through any desired screen or die cast machine, or formed into grains using any desired method in the usual manner. The grains in any case, need to be cured in an oven at ordinary temperature in the usual manner. The cured grains can then be placed loosely into shell casings for use in standard ammunition, or can be placed into baggies for use in canons or the like.
Burn rate: Typical.
Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Very low.
Explosive ability: None.
Percentage: ***76.27% potassium nitrate, 13.55% charcoal, 10.16% sulfur, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used for small arms weapons, cannons, and fireworks.

01-01-009A: Black powder composition:
Into a vertical mixer, or any suitable mixing drum, bowl, ect, equipped with motorized stirrer, place 500 milliliters of hexane, followed by ***800 grams of potassium nitrate of average commercial mesh***, followed by ***190 grams of soft wood charcoal***, and then followed by ***110 grams of double sublimed sulfur***. Thereafter, blend the entire mixture at moderate speed for about 30 minutes. Thereafter, filter-off the insoluble mass, and then place this mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Once it has, place the dried mass into any desired ball mill, filled with 500 grams of lead shot, and then tumble the mixture at 250 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the material can be moistened with alcohol or acetone, and then pressed through any desired screen or die cast machine, or formed into grains using any desired method. Thereafter, cure the grains in an oven at 60 to 90 Celsius until dry and hard. The cured grains can then be placed loosely into shell casings for use in standard ammunition, or the ball-milled product can be placed directly into baggies for use in canons, or in fireworks, ect., ect.
Burn rate: Typical.
Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Very low.
Explosive ability: None.
Percentage: ***72.72% potassium nitrate, 17.27% charcoal, 10% sulfur, 0.01% mixed residue***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used for small arms weapons, cannons, and fireworks.

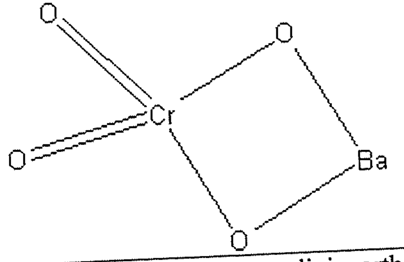
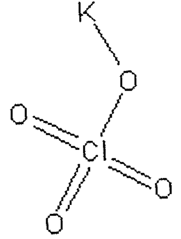
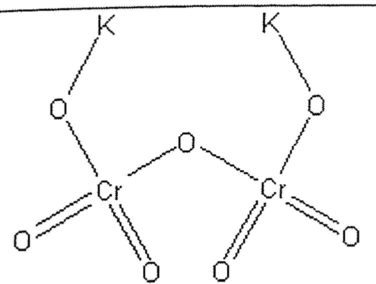
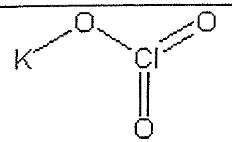
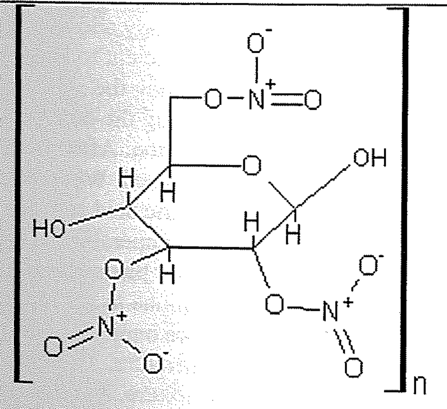
01-01-010A: Black powder composition:
Into a vertical mixer, or any suitable mixing drum, bowl, ect, equipped with motorized stirrer, place 1500 milliliters of hot water, followed by ***740 grams of potassium nitrate of average commercial mesh***. Thereafter, blend the mixture on moderate speed for abo 45 minutes. Thereafter, add in ***150 grams of soft wood charcoal***, and then followed by ***100 grams of sulfur powder***. Thereafter, continue to blend the entire mixture at moderate speed for about 30 additional minutes. Thereafter, add in 750 milliliters of acetone, and then continue to blend the entire mixture for about 1 hour. Thereafter, filter-off the insoluble mass, and then place this mass onto shallow tray or pan, and allow it to thoroughly air-dry. Note: the acetone can be recovered if desired by using any desired means. On the dried mass has dried, it is ready for use. To use, the material can be moistened with alcohol or acetone, and then pressed through any desired screen or die cast machine, or formed into grains using any desired method. Thereafter, cure the grains in an oven at 60

90 Celsius until dry and hard. The cured grains can then be placed loosely into shell casings for use in standard ammunition, or the ball-milled product can be placed directly into baggies for use in canons, or in fireworks, ect., ect.
Burn rate: Typical.
Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Very low.
Explosive ability: None.
Percentage: ***74.74% potassium nitrate, 15.15% charcoal, 10.10% sulfur, 0.01% mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used for small arms weapons, cannons, and fireworks.

01-01-011A: Black powder composition:
Into a suitable ball mill, filled with 250 grams of heavy steel shot, place ***150 grams of soft wood charcoal***, and then followed by ***100 grams of sulfur powder***. Thereafter, tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***750 grams of potassium nitrate***, and then followed by 400 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture on moderate speed for about 2 hours. Thereafter, add in 400 milliliters of cold water, then continue to blend the mixture on moderate speed for about 1 hour. Thereafter, filter-off the insoluble mass, and then place the wet mass into a suitable ball mill, filled with 350 grams of steel shot, and equipped with vacuum. Thereafter, tumble the mixture at 150 RPM at room temperature and a suitable vacuum to remove the alcohol and water. Once the mixture is dried, remove the vacuum, and continue to tumble the mixture at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture can be used directly as a loose powder, or moistened with a little alcohol, and then extruded through any die cast machine to form grains of any desired size. The "wet" grains then need to be cured in an oven under the usual means.
Burn rate: Typical.
Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Very low.
Explosive ability: None.
Percentage: ***75% potassium nitrate, 15% charcoal, 10% sulfur***
Classification: Deflagrating explosive (classified as propellant)
Use: May be used for small arms weapons, cannons, and fireworks.

2. Modified Black powder

Chemicals used in this section

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon**
	Sugar carbon is prepared by roasting sugar at 150 to 300 Celsius until nothing but a black residue remains.
5. Barium Chromate	**6. Potassium Perchlorate**
	
Barium Chromate forms yellow monoclinic, orthorhombic crystals. The crystals are toxic, so users should wear gloves when handling.	Potassium perchlorate forms colorless or white crystals, or crystalline powder. The salt decomposes when heated to 400 Celsius.
	Method of preparation 1: 1. Dissolve 100 grams of sodium perchlorate into 100 milliliters of water at room temperature. 2. Dissolve 61 grams of potassium chloride into 179 milliliters of water room temperature. 3. Thoroughly blend both solutions at room temperature, and then chill the mixture in an ice bath at 0 Celsius for about 1 hour. After 1 hour, filter-off the precipitated potassium perchlorate, and then vacuum dry or air-dry the solid.
	Method of Preparation 2: Into a suitable crucible, place 100 grams of potassium chlorate, followed by 50 grams of potassium chloride. Thereafter, briefly shake the crucible to mix the two salts. Then gently and slowly heat the mixture using a Bunsen burner to about 370 Celsius. Be sure to carefully monitor the temperature using a temperature probe or equivalent. Shortly thereafter, a gentle gas evolution of oxygen will take place. Keep heating the mixture at about 380 Celsius until the evolution of gas ceases. After the evolution of gas has ceased, immediately remove the heat source, and allow the mixture to cool to room temperature. Then, using a knife or other sharp and hard instrument, fracture and pulverize the solid mass in the crucible, and then place this pulverized mass into a suitable beaker, or container. Thereafter, add in 200 milliliters of water (at room temperature), and then rapidly stir the entire mixture for about 1 hour to dissolve the potassium chloride. After stirring for 1 hour, filter-off the insoluble potassium perchlorate, and then vacuum dry or air-dry the crystals.
7. Potassium Dichromate	**8. Ammonium Bisulfide**
	H_4N^+—SH^-
Potassium Dichromate forms beautiful bright orange-red crystals. The crystals are very stable in air, and can be stored for years.	Forms white tetragonal orthorhombic crystals, which sublime quite readily. The commercial product is obtained in porcelain lumps to preserve it more from decomposition. The salt is readily soluble in water and other common solvents.
9. Potassium chlorate	**10. Carbon Disulfide**
	S=C=S
Potassium chlorate forms colorless to white crystalline solid. The salt has a melting point of 368 Celsius, and decomposes into oxygen at higher temperatures. Potassium chlorate is relatively insoluble in water and most common solvents.	Carbon disulfide is a colorless refractive liquid with foul smelling odor. It has a boiling point of 46.5 Celsius. The liquid is toxic, and users should wear proper gloves and use proper ventilation when handling. The liquid is prepared by dry distillation of sulfur and charcoal at high temperature
Method of preparation 1: 1. Dissolve 100 grams of sodium chlorate, into 110 milliliters of water at room temperature. 2. Dissolve 70 grams of potassium chloride into 200 milliliters of water at room temperature. 3. Thoroughly mix both mixtures, and the chill the combined mixture at 0 Celsius for about 1 hour. Thereafter, filter-off the precipitated potassium chlorate, and then vacuum dry or air-dry the solid.	
11. Nitrocellulose	
	
Nitrocellulose forms a pulpy, cotton-like mass, white granules, flakes, or powder with a nitrogen content of 10 to 14%. Explosives grade nitrocellulose usually contains 12 to 14% nitrogen, and propellant grade nitrocellulose can contain 11 to 14% nitrogen content. It is soluble in acetone, but insoluble in water. Nitrocellulose is highly flammable, and even wetted nitrocellulose can burn. It is an excellent propellant, and is used extensively in military smokeless gunpowders—especially when mixed with nitroglycerine. Nitrocellulose is widely used in rocket propellants, gun propellants, and blasting compositions—the later when mixed with ammonium nitrate, sodium nitrate, or saltpeter. Nitrocellulose is available in many different forms with	

varying nitrogen contents, and can be made by nitrating wood, wood pulp, cotton, cellulosic waste, newspaper, and may different cellulose containing entities—numerous modifications and processes for its preparation exist. Pure nitrocellulose should be stored wetted with 10% water or alcohol for prolonged storage.

Method of Preparation 1: Place 608 grams of phosphorus pentoxide into a suitable flask, and then add 2000 milliliters of methylene chloride. Then add 920 grams of 99% nitric acid. After which, cool this mixture to -5 Celsius by the means of a salt/ice bath. Now, place 1000 milliliters of methylene chloride into a suitable beaker, and then add 324 grams of cotton balls. Then vigorously stir the mixture for 1 hour and then cool the mixture to -5 Celsius by means of a salt/ice bath. Afterwards, at a moderately fast rate, add the cooled methylene chloride/cotton balls mixture to the 99% nitric acid mixture while stirring the 99% nitric acid mixture. During the addition, the reaction temperature will increase to about 25 – 30 Celsius. After the addition, stir the reaction mixture for 1 hour and maintain the temperature below 30 Celsius. After 1 hour, pour the entire reaction mixture into 3000 milliliters of ice-cold water, and stir the ice-cold water for 1 hour. After which, filter-off the insoluble nitrocellulose mass, wash with four 500-milliliter portions of ice cold water, four 150 milliliter portions of 10% baking soda solution, and then four 500 milliliter portions of cold water. Thereafter, vacuum dry or air-dry the nitrocellulose.

Method of Preparation 3: Into a beaker, place 192 grams of 60% nitric acid, and then carefully add 274 grams of 98% sulfuric acid. Thereafter, heat the acid mixture to about 50 Celsius. When the temperature reaches about 50 Celsius, rapidly add 100 grams of a cellulose mixture, prepared by mixing 50 grams of cellophane pieces (cut into pieces by hand), with 50 grams of ground-up cotton. After the addition, stir the acid mixture rapidly for 90 minutes at 50 Celsius. After heating and stirring for 90 minutes, remove the heat source, and cool the reaction mixture to room temperature. Then drown the reaction mixture into 3000 milliliters of ice water, and then stir the mixture for ten minutes. After which, filter-off the insoluble product, wash with 500 milliliters of cold water, four 150-milliliter portions of 10% baking soda solution, followed by 500 milliliters of water. Then, vacuum dry or air-dry the product. Note: The filter cake may contain some impurities.

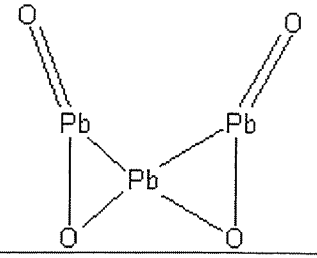
Method of Preparation 5: Into a beaker, place 2 kilograms of 98% sulfuric acid, and then place this acid mixture into a ice bath and chill to 0 Celsius. Thereafter, place 2840 grams of newspaper into a separate beaker, and then moisten the newspaper by the addition of a small amount of water. Note: add just enough water to moisten the paper, but not to the point where the newspaper becomes fragile, and easily torn. Then, add this moistened newspaper, in portions, to the sulfuric acid at such a rate to keep the sulfuric acid at 0 Celsius at all times. During the addition, rapidly stir the sulfuric acid. After the addition, rapidly stir the acid mixture at 0 Celsius for about 1 hour. Then, filter-off the pulpy cellulose mass, wash with 1000 milliliters of warm water, and then dry by pressing the cellulosic mass to exclude as much of the liquids as possible. Thereafter, allow the cellulosic mass to dry at room temperature for several days. Thereafter, place the dry cellulosic material into a grinding machine, and grind into a fine particle size. After which, place 2 kilograms of 70% nitric acid into a beaker, and then carefully add 1000 grams of 98% sulfuric acid. Then heat this acid mixture to 40 Celsius with constant stirring. Thereafter, add in portions, the dry cellulosic material obtained earlier over a period of about 30 minutes. After the addition, rapidly stir the reaction mixture at 40 Celsius for 2 hours. Thereafter, remove the heat source, and allow the reaction mixture to cool to room temperature. Then add the reaction mixture to 10-liters of ice, and then stir the mixture for ten minutes. After which, filter-off the insoluble product, wash with 500 milliliters of cold water, then with four 500-milliliter portions of 10% baking soda solution, and then 1000 milliliters of water. After the washing, vacuum dry or air-dry the product.

Method of Preparation 2: Into a beaker, place 200 grams of wood pulp (paper making grade), and then add 140 milliliters of water. Thereafter, add 200 grams of 15% sodium hydroxide, and then heat the mixture for 1 hour at 80 to 100 Celsius. After the heating period, remove the heat source, allow the mixture to cool to room temperature, and then add 100 milliliters of carbon disulfide. Thereafter, stir the resulting gelatinous mass for 1 hour, and then filter-off the mass, wash with several hundred millimeters of warm water, and then dry by pressing it upon a block (to extrude as much of the liquid content as possible, and then air-dry the cellulosic material for several days. Thereafter, place the cellulosic material into a grinding machine, and grind into a fine particle size. After which, place 314 grams of 99% nitric acid into a beaker, and then slowly add 62 grams of 98% sulfuric acid. Afterwards, slowly add 12 grams of water. Then heat this acid mixture to 40 Celsius with constant stirring. Then, add in portions, the dry cellulosic material obtained earlier over a period of about 30 minutes. After the addition, rapidly stir the reaction mixture at 40 Celsius for 1 hour. Thereafter, remove the heat source, and allow the reaction mixture to cool to room temperature. Then, add the reaction mixture into 1000 milliliters of ice water, and then stir for ten minutes. After which, filter-off the insoluble product, wash with 500 milliliters of cold water, then with four 150-milliliter portions of 10% baking soda solution, and then 500 milliliters of water. After the washing, vacuum dry or air-dry the product.

Method of Preparation 4: Into a beaker, place 10 kilograms of 98% sulfuric acid, and then place this acid mixture into a ice bath and chill to 0 Celsius. Thereafter, slowly add in portions, 2 kilograms of standard cotton at a rate sufficient to keep the sulfuric acid at 0 Celsius at all times. During the addition, rapidly stir the sulfuric acid. Note: allowing the temperature to rise may result in carbonization of the cotton. After the addition, continue to stir until a pulpy-mass is obtained. When it is, gradually pour in 4 kilograms of 70% nitric acid at a rate sufficient to keep the reaction mixtures temperature at 0 Celsius. During the nitric acid addition, rapidly stir the reaction mixture. After the addition of the nitric acid, continue to stir at 0 Celsius for 3 hours. After 3 hours, remove the ice bath, and allow the reaction mixture to warm to room temperature. Thereafter, Add 10 liters of cold water to the reaction mixture, and then stir for ten minutes. Then filter-off the precipitated mass, wash with two 500-milliliter portions of cold water, then four 500-milliliter portions of 10% baking soda solution, and then with two 500-milliliter portions of warm water. Afterwards, vacuum dry or air-dry the product.

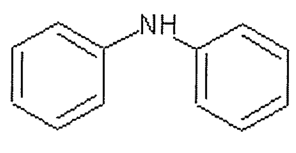
Method of Preparation 6: Into a beaker, place 314 grams of 99% nitric acid, and then 140 grams of 98% sulfuric acid. Thereafter, slowly add 64 grams of water. Then heat this nitrating acid mixture to about 40 Celsius with rapid stirring, and then add 106 grams of wood cellulose (94% dry bases; obtained from alkali lye extraction using a boiling 20% sodium hydroxide solution upon wood chips). After the addition, rapidly stir the acid mixture at 40 Celsius for 1 hour, and then cool the reaction mixture to room temperature. Then drown the reaction mixture into 1500 milliliters of ice water, and then stir the mixture for ten minutes. Then, filter-off the insoluble product, wash with 1000 milliliters of cold water, four 150-milliliter portions of 10% baking soda solution, followed by 1000 milliliters of water. Then, vacuum dry or air-dry the product. Note: The filter cake may contain some impurities.

12. Lead Tetraoxide



Forms a bright red, bulky powder. The powder is poisonous, and a strong oxidizer. Lead Tetraoxide is insoluble in water and alcohol, but soluble in hot acid. The powder is good oxidizer, which looses oxygen when heated to 500 Celsius.

13. Diphenylamine



Diphenylamine forms crystals with a floral odor. The crystals have a melting point of 54 Celsius, and a boiling point of 302 Celsius. The crystals are insoluble in water, but soluble in alcohol, and other common solvents. The solid is prepared by heating a mixture of aniline with aniline hydrochloride.

14. Titanium Dioxide

O=Ti=O

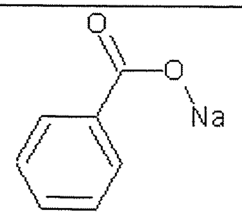
Titanium Dioxide forms a white powder with a high melting point of 1855 Celsius. The powder is insoluble in water and most solvents. Titanium Dioxide exists in nature.

15. Manganese Dioxide

O=Mn=O

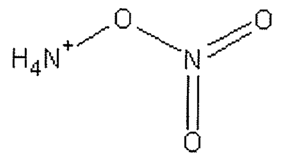
Black powder forming tetragonal crystals. The compound is insoluble in water in the usual organic solvents. Manganese Dioxide is a strong oxidizing agent.

16. Sodium Benzoate



Sodium Benzoate forms a colorless to white crystalline granules, or powder. The crystals are soluble in water, but relatively insoluble in most solvents. Sodium Benzoate is non-toxic and is widely used as a preservative in foodstuffs.

17. Ammonium Nitrate

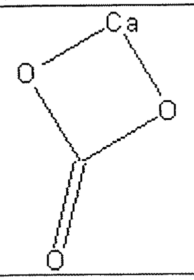


Ammonium nitrate forms odorless, transparent, hygroscopic, and deliquescent crystals or white granules. It decomposes at 210 Celsius into water and nitrous oxide (laughing gas). Ammonium nitrate is very soluble in water, and alcohol. It is widely available commercially, and is available in a number of products including fertilizers and garden products. For use in explosives, AN is commonly used admixed with fuel oil, diesel fuel, TNT, oils, and aluminum for explosives compositions. Ammonium nitrate mixed with oils and fuels are commonly called prills, and are highly stable mixtures widely used in mining and engineering operations. Because ammonium nitrate prills are quite stable for long-term storage and they yield no noxious fumes upon detonation, they are called “safety explosives”. Ammonium nitrate and TNT are commonly used as military dynamites, and blasting charges for military engineering purposes. Ammonium nitrate should be stored in tightly sealed, amber glass bottles, or non-transparent plastic containers in a well-cooled area protected from sunlight.

Method of Preparation 1: Dissolve 206 grams of 70% nitric acid into 600 milliliters of water. Then cool the diluted nitric acid solution to 0 Celsius by means of an ice bath while stirring continuously. Next, bubble 40 grams of ammonia gas into the nitric acid mixture over a period of one hour while stirring and maintaining the reaction mixtures temperature at 0 Celsius. Or slowly add 136 grams of 28 – 30% ammonia solution, or 400 grams of a 10% ammonia solution into the diluted nitric acid solution while stirring and maintaining the diluted nitric acids temperature at 0 Celsius. Upon completion of the ammonia addition, recrystallize the ammonium nitrate from the reaction mixture, and then vacuum dry or air dry the product. If a rotary evaporator is available, place the filtered reaction mixture there into, and remove the water under high vacuum. Then, recrystallize the ammonium nitrate from methanol (2 grams ammonium nitrate dissolves in 16 milliliters methanol), and then vacuum dry or air-dry the product. The product will weigh about 180 to 188 grams and will be of 99% purity.

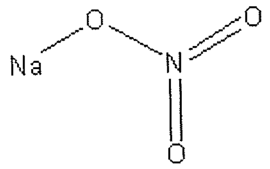
Method of Preparation 2: Dissolve 1000 grams of sodium nitrate into 2300 milliliters of water. Then add 740 grams of 28 – 30% ammonia solution, or 2000 grams of 10% ammonia solution, or pass 200 grams of anhydrous ammonia into the nitrate solution while stirring the nitrate solution. Thereafter, place this mixture into an ice bath, and chill to 0 Celsius. Then, pass 3530 grams of dry carbon dioxide into the reaction mixture at a steady rate while stirring the reaction mixture and maintaining its temperature at 0 Celsius, or add in pieces, 3000 grams of dry ice. After the carbon dioxide addition, continue to stir the reaction mixture for 30 minutes at 0 Celsius, and then filter-off the precipitated sodium bicarbonate. Thereafter, recrystallize the ammonium nitrate from the reaction mixture. If a rotary evaporator is available, place the filtered reaction mixture there into, and remove the water under high vacuum. After the recrytsallization process, vacuum dry or air-dry the crystals. Then, recrystallize the ammonium nitrate from methanol (2 grams ammonium nitrate dissolves in 16 milliliters methanol), and then vacuum dry or air-dry the product. Recrystallize the ammonium nitrate from methanol is not necessary if the ammonium nitrate is to be used in making prills. If the ammonium nitrate is to be alloyed with sensitive high explosives such as picric acid, picric acid salts, styphnic acid, or styphnic acid salts, the ammonium nitrate should be recrystallized from methanol.

18. Calcium Carbonate



Calcium Carbonate is a white powder, granules, or solid material of various sizes. The product is very common and exists as chalk, and other natural materials. The dry solid breaks down to lime when heated to high temperatures.

19. Sodium Nitrate

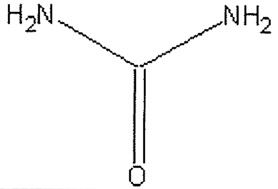


Sodium Nitrate forms colorless to white crystals, granules, or powder. The crystals have a melting point of 308 Celsius, but they begin to decompose at higher temperatures. The solid compound is very soluble in water, slightly in alcohol, but relatively insoluble in most solvents.

Method of Preparation 1:

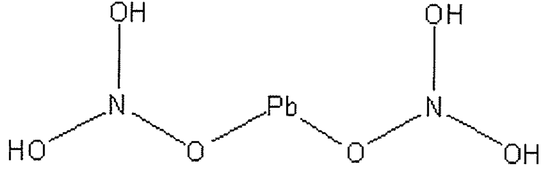
1. Dissolve 130 grams of concentrated nitric acid into 200 milliliters of water at room temperature.
2. Slowly add, in small portions at a time to the nitric acid solution, 63 grams of sodium hydroxide, or 133 grams of baking soda.
3. After the addition, boil the solution to remove water, and recover the sodium nitrate.

20. Urea



Urea forms a crystalline powder, granules, or solid material of tetragonal prisms. The crystals have a melting point of 132 Celsius, but tend to develop the odor of ammonia at room temperature. The solid is soluble in water, and alcohol, soluble in acids, but relatively insoluble in most common laboratory solvents.

21. Lead Nitrate



Lead nitrate forms colorless to white, translucent crystals. The crystals are poisonous so users should wear gloves when handling. Lead nitrate is soluble in water, but not very soluble in other solvents. It is prepared by dissolving lead oxides into nitric acid.

22. Nitro Starch

Nitro starch forms an orange colored powder, which is highly flammable. It has a average nitrogen content of 16.5%. It is soluble in a mixture of 95% ethanol and 99% diethyl ether (ratio of 1 to 1). When dry, it is easily ignited and explodes when mixed with oxidizers and reducing agents. Overall, the properties of nitro starch are similar to nitrocellulose. The dry compound should never be stored dry, but should be stored wet with 10% water of alcohol. Nitro starch is used successfully as a substitute for nitrocellulose in smokeless gunpowders, rocket propellants, fireworks, and blasting compositions when mixed with sodium or potassium nitrate, TNT, RDX, ammonium nitrate, or perchlorates.

Method of Preparation 1: Place 448 grams of 55% nitric acid into a beaker, and cool to -5 Celsius by means of an ice/salt bath. Then Slowly add 21.4 grams of finely divided dry cornstarch while stirring and maintaining the 55% nitric acid at -5 Celsius. Next, prepare a nitrating acid mixture by carefully adding 890 grams of 98% sulfuric acid into 224 grams of 99% nitric acid. Then slowly add this nitrating acid to the 55% nitric acid/cornstarch mixture while stirring the 55% nitric acid/cornstarch mixture, and maintain its temperature at -5 Celsius. After the addition of the nitrating acid, remove the ice/salt bath, and then pour the entire reaction mixture into 1500 milliliters of ice-cold water. Then stir the ice-cold water for 30 minutes. After which, filter-off the precipitated product, wash with 1000 milliliters of 1% ammonia solution, and then with 1500 milliliters of hot water. After washing, dry the nitro starch product in an oven at 70 Celsius for 1 hour or until dry, or vacuum dry the product.

Section 1: Black Powder/Modified Black Powder

- Modified Black Powder Compositions in this section -

1. 02-01-001A: Standard "reduced burn rate" time fuse mixture: *99.99% black powder, 0.01% oil*	**2. 02-01-001B: "Reduced burn rate" fuse powder directly from potassium nitrate:** *72% potassium nitrate, 21% charcoal, 6.5% sulfur, and 0.5% oil*
3. 02-01-002A: "Reduced burn rate" fuse powder directly from potassium nitrate: *72.8% potassium nitrate, 14.5% charcoal, 9.7% sulfur, and 3% rosin*	**4. 02-01-003A: Modified black powder for use in fuse (slow burning black powder composition):** *74% potassium nitrate, 12.4% sugar carbon, 10.4% sulfur, 3.1% charcoal, 0.10% impurities*
5. 02-01-004A: Gasless pyrotechnic composition for use in gasless and smokeless time fuse: *71.2% barium chromate, 16.8% zirconium/nickel alloy, 7.9% potassium perchlorate, 2.9% ethyl cellulose, 0.99% potassium dichromate, 0.21% residue*	**6. 02-01-004B: Gasless pyrotechnic composition for use in gasless and smokeless time fuse (modified burn rate):** *62.3% barium chromate, 21.8% zirconium/nickel alloy, 14.5% potassium perchlorate, 1.3% potassium dichromate, 0.10% residue*
7. 02-01-004C: Gasless pyrotechnic composition for use in gasless and smokeless time fuse (modified burn rate 2): *56.1% barium chromate, 27.5% zirconium/nickel alloy, 14.7% potassium perchlorate, 1.4% potassium dichromate, 0.30% residue*	**8. 02-01-005A: Chlorate slow burning fuse composition:** *41% Brazilian natural rubber, 27.3% charcoal, 13.6% glass, 13.6% potassium chlorate, 4.1% ammonium bisulfide, 0.40% residue*
9. 02-01-006A: Pyrotechnic composition for time fuses: *37.5% Indian rubber, 25% soft wood charcoal, 12.5% potassium chlorate, 12.5% glass, 12.5% carbon disulfide*	**10. 02-01-007A: Nitrocellulose containing pyrotechnic composition for fuses (gasless):** *25% nitrocellulose, 24% dibutyl phthalate, 20.5% lead tetraoxide, 16.5% potassium nitrate, 13% silicon, 1% diphenylamine*
11. 02-01-008A: Modified "high reduced burn" black powder composition: *62.74% potassium nitrate, 23.52 sulfur, 11.76% charcoal, 1.96% alpha-napthyl amine, 0.02% mixed residual balance*	**12. 02-01-008B: Modified "high reduced burn" black powder composition:** *67.96% potassium nitrate, 29.12% charcoal, 2.91% alpha-napthyl amine, 0.01% mixed residual balance*
13. 02-01-009A: Modified black powder composition for use in time fuse and delays: *51.36% potassium nitrate, 31.5% titanium dioxide, 10.27% charcoal, 6.84% sulfur, 0.03% balance*	**14. 02-01-009B: Modified black powder composition for use in time fuse and delays:** *52.81% potassium nitrate, 29.57% manganese dioxide, 10.56% charcoal, 7.04% sulfur, 0.02% balance*
15. 02-01-009A: "Graphite" black powder composition: *74% potassium nitrate, 14% graphite, 12% sulfur*	**16. 02-01-09B: "Graphite" black powder composition (modified):** *74% potassium nitrate, 14% graphite, 12% sulfur*
17. 02-01-010A: Thermally stable modified black powder composition: *60% sodium nitrate, 17.8% charcoal, 10% sulfur, 10% ammonium nitrate, 1.2% calcium carbonate, 1% urea*	**18. 02-01-011A: Reduced chamber pressure modified black powder suitable for small arms:** *44.5% potassium nitrate, 18.8% potassium perchlorate, 10.8% sodium benzoate, 8.9% hard wood charcoal, 5.9% of sulfur, 5.9% dicyandiamide, 3.9% dextrin, 0.49% wax, 0.49% graphite, 0.32% residue*
19. 02-01-012A: Modified black powder composition utilizing cellulose fibers for added stability and energy output: *60% potassium nitrate, 20% cellulose, 20% erythorbic acid*	**20. 02-01-012B: Modified black powder composition utilizing cellulose fibers for making consumable gun case cartridges:** *60% potassium nitrate, 20% cellulose, 20% erythorbic acid*
21. 02-01-013A: Modified black powder composition utilizing coated sodium nitrate: *71.6% sodium nitrate, 15.9% charcoal, 11.9% sulfur, 0.49% graphite, 0.11% mixed impurities*	**22. 02-01-014A: Basic modified black powder composition for use in canons:** *75% potassium nitrate, 25% gum Arabic*
23. 02-01-015A: Modified black powder composition with increased burn rate: *75% potassium nitrate, 15% sodium benzoate, 10% sulfur*	**24. 02-01-016A: Specialty modified black powder composition:** *72% lead nitrate, 18% sulfur, 10% nitro starch*
25. 02-01-017A: Reduced burn black powder composition for various uses: *72.8% sodium nitrate, 14.5% charcoal, 9.7% sulfur, 3% rosin*	**26. 02-01-017B: Reduced burn black powder composition for various uses:** *72.8% potassium nitrate, 14.5% charcoal, 9.7% sulfur, 3% gum Arabic*
27. 02-01-018A: Modified "high reduced burn" black powder composition: *73.52% potassium nitrate, 16.66% charcoal, 7.84% sulfur, 1.96% alpha-napthyl amine, 0.02% mixed residual balance*	**28. 02-01-019A: Modified "reduced burn" black powder composition:** *74% potassium nitrate, 16.5% carbon black, 9.5% sulfur*
29. 02-01-020A: Modified "reduced burn" black powder composition: *74% potassium nitrate, 10.4% sulfur, 9.36% soft wood charcoal, 6.24% sugar carbon*	

02-01-001A: Standard "reduced burn rate" time fuse mixture:
Place ***200 grams of regular black powder*** (of any grain and brand), into a tumbler machine, and then add in ***2 grams of caster oil, linseed oil, olive oil, corn oil, cotton seed oil, or any lubricating oil***, followed by 50 grams of steel balls of 4 to 5 millimeters in diameter. Thereafter, rotate the mixture using the tumbler machine for 1 hour at nominal speed (about 180 to 200 RPM). After rotating for 1 hour, pour in 100 milliliters of *distilled water*, and continue to tumble the mixture for 1 hour at 180 to 200 RPM. Thereafter, remove the entire bulky mass, and spread it out onto a shallow pan, and allow it to dry fully. Once the mass has been dried, thoroughly pulverize the mass using either a crucible or clean ball mill. This mixture should then be packed into fuses using the normal techniques for fuse preparation.
Burn rate: 55 to 57 seconds per foot.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***99.99% black powder, 0.01% oil***
Classification: Deflagrating explosive (classified as propellant).
Use: Time fuse, delay fuses for grenades and other fuses, and in delay elements for a wide variety of munitions.

02-01-001B: "Reduced burn rate" fuse powder directly from potassium nitrate:
Into a standard ball mill, place ***144 grams of potassium nitrate*** of 99%+ purity, followed by ***13 grams of sulfur*** of 99% purity, followed by ***42 grams of standard charcoal***, followed finally by ***1 gram of castor oil, linseed oil, olive oil, corn oil, cotton seed oil, or any lubricating oil***. Thereafter, add in 50 grams of steel balls of 4 to 5 millimeters in diameter. Thereafter, rotate the mixture using the ball mill for 1 hour at 100 to 180 RPM. Afterwards, remove the mass, and them spread it out on a shallow pan and allow it to cure for several days. This mixture should then be packed into fuses using the normal techniques for fuse preparation.
Note: The potassium nitrate can be replaced with the same gram amount of *sodium nitrate, lithium nitrate*, or *any anhydrous nitrate* of 98% purity or better (with the exception of ammonium nitrate).
Note: Nitrates containing magnesium, calcium, or metals might have burning rates from 45 to 60 seconds per foot. *Ammonium nitrate should not be used.*
Burn rate: 52 to 57 seconds per foot.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***72% nitrate, 21% charcoal, 6.5% sulfur, and 0.5% oil***
Classification: Deflagrating explosive (classified as propellant).
Use: Time fuse, delay fuses for grenades and other fuses, and in delay elements for a wide variety of munitions.

02-01-002A: "Reduced burn rate" fuse powder directly from potassium nitrate:
Into a standard ball mill, place ***145.6 grams of powdered potassium nitrate*** or ***sodium nitrate***, followed by ***19.4 grams of powdered sulfur, 29 grams of regular wood charcoal*** (any quality wood charcoal), and then ***6 grams of standard rosin***. Then quickly add in 25 grams of steel balls of 4 to 5 millimeters in diameter. Thereafter, tumble the entire mixture for 1 hour at 180 RPM. Thereafter, remove the entire mass, and then lay it onto a shallow pan or tray and allow it to air-dry fully. Thereafter, thoroughly pulverize the mixture using a crucible or clean ball mill. This mixture should then be packed into fuses using the normal techniques for fuse preparation.
Burn rate: 45 seconds per foot.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Can only be detonated under severe conditions.
Percentage: ***72.8% nitrate, 14.5% charcoal, 9.7% sulfur, and 3% rosin***
Classification: Deflagrating explosive (classified as propellant).
Use: Time fuse, delay fuses for grenades and other fuses, and in delay elements for a wide variety of munitions.

02-01-003A: Modified black powder for use in fuse (slow burning black powder composition):

Into a suitable blender equipped with plastic stir blade, place 350 milliliters of 95% ethyl alcohol, and then add in ***52 grams of flours of sulfur***, followed by ***15.6 grams of standard wood charcoal,*** and then followed by ***62.4 grams of pulverized sugar carbon*** (prepared by thoroughly burning sugar until nothing but the carbon remains, and then pulverizing by hand). Then thoroughly blend the mixture on low speed for about 30 minutes. After 30 minutes, throw in ***370 grams of potassium nitrate***, and then continue blending the mixture on low speed for about 2 hours to form a good mix. After blending the mixture for 2 hours, filter the mixture using gravity or vacuum filtration to collect the insoluble mixture. After the filtration process, place the filtered mass onto a shallow pan, and allow it to air-dry for several days. After then, place the dried mass into a ball mill, filled with steel shot of 5 millimeters in diameter or so, and then tumble the mixture at 300 RPM for about 1 hour to form a uniform ground mixture. Thereafter, to use the mixture, it should be packed into the desired fuse tube under pressure.

Burn rate: about 66 seconds per foot
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7
Tendency to cake: Less likely then ordinary black powder.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***74% potassium nitrate, 12.4% sugar carbon, 10.4% sulfur, 3.1% charcoal, 0.10% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in time fuse, and for delay trains in blasting caps and detonators.

02-01-004A: Gasless pyrotechnic composition for use in gasless and smokeless time fuse:
Into a suitable ball mill, filled with 150 grams of steel shot of 5 millimeters in diameter, place ***85 grams of finely powdered zirconium/nickel alloy*** (commercially available), and containing 50% zirconium and 50% nickel, and then add in ***5 grams of potassium dichromate***, and then tumble the mixture for about 15 to 20 minutes to coat the metal alloy with the dichromate. Thereafter, remove the coated zirconium/nickel alloy, and place it into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blade, and then add in ***40 grams of potassium perchlorate***, followed by ***15 grams of ethyl cellulose***, and then followed by ***360 grams of barium chromate***, and then blend the mixture on moderate speed for about 1 hour to form a uniform paste. Thereafter, place the pasty mass onto a shallow tray, and allow it to thoroughly air-dry. Once it has, place the dried mass into a suitable clean ball mill, filled the usual amount of steel shot of the usual diameter, and then tumble the mixture for about 45 minutes to 1 hour at 250 RPM to form a uniform powder. Now, to use the powder, it simply needs to be pressed into fuse bodies or tubes under pressure using the normal techniques.

Burn rate: 6 seconds per inch at 0.2 inch diameter fuse body.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***71.2% barium chromate, 16.8% zirconium/nickel alloy, 7.9% potassium perchlorate, 2.9% ethyl cellulose, 0.99% potassium dichromate, 0.21% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in smokeless and gasless time fuses for multiple uses.

02-01-004B: Gasless pyrotechnic composition for use in gasless and smokeless time fuse (modified burn rate):
Into a suitable ball mill, filled with 150 grams of steel shot of 5 millimeters in diameter, place ***105 grams of finely powdered zirconium/nickel alloy*** (commercially available), and containing 30% zirconium and 70% nickel, and then add in ***6.5 grams of potassium dichromate***, and then tumble the mixture for about 15 to 20 minutes to coat the metal alloy powder with the dichromate. Thereafter, remove the dichromate coated zirconium/nickel alloy, and place it into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blade, and then add in ***70 grams of potassium perchlorate***, followed by ***300 grams of barium chromate***, and then blend the mixture on moderate speed for about 1 hour to form a uniform paste. Thereafter, place the pasty mass onto a shallow tray, and allow it to thoroughly air-dry. Once it has, place the dried mass into a suitable clean ball mill, filled the usual amount of steel shot of the usual diameter, and then tumble the mixture for about 45 minutes to 1 hour at 250 RPM to form a uniform powder. Now, to use the powder, it simply needs to be pressed into fuse bodies or tubes under pressure using the normal techniques.

Burn rate: 12 seconds per inch at 0.20 inch diameter fuse body.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 4 ¾
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.

Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***62.3% barium chromate, 21.8% zirconium/nickel alloy, 14.5% potassium perchlorate, 1.3% potassium dichromate, 0.10% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition)
Use: Used in smokeless and gasless time fuses for multiple uses.

02-01-004C: Gasless pyrotechnic composition for use in gasless and smokeless time fuse (modified burn rate 2):
Into a suitable ball mill, filled with 150 grams of steel shot of 5 millimeters in diameter, place ***140 grams of finely powdered zirconium/nickel alloy*** (commercially available), and containing 30% zirconium and 70% nickel, and then add in ***7.5 grams of potassium dichromate***, and then tumble the mixture for about 15 to 20 minutes to coat the metal alloy powder with the dichromate. Thereafter, remove the dichromate coated zirconium/nickel alloy, and place it into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blade, and then add in ***75 grams of potassium perchlorate***, followed by ***285 grams of barium chromate***, and then blend the mixture on moderate speed for about 1 hour to form a uniform paste. Thereafter, place the pasty mass onto a shallow tray, and allow it to thoroughly air-dry. Once it has, place the dried mass into a suitable clean ball mill, filled the usual amount of steel shot of the usual diameter, and then tumble the mixture for about 45 minutes to 1 hour at 250 RPM to form a uniform powder. Now, to use the powder, it simply needs to be pressed into fuse bodies or tubes under pressure using the normal techniques.

Burn rate: 20 seconds per inch at 0.20 inch diameter fuse body.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 4 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***56.1% barium chromate, 27.5% zirconium/nickel alloy, 14.7% potassium perchlorate, 1.4% potassium dichromate, 0.30% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in smokeless and gasless time fuses for multiple uses.

02-01-005A: Chlorate slow burning fuse composition:
Into a suitable mixing bowl, such a stainless steel wide mouth bowl, place ***100 grams of powdered soft wood charcoal,*** followed by ***50 grams of glass powder,*** followed by ***50 grams of potassium chlorate,*** followed by ***150 grams of natural Brazilian rubber,*** followed by 75 milliliters of hexane, and then thoroughly blend the mixture using a stainless steel spatula or similar item for about 30 minutes to form a uniform fluidized pasty mass. After 30 minutes, add in ***15 grams of ammonium bisulfide***, and then continue to blend the mixture until the bulk of the hexane has been evaporated. When most of the hexane has evaporated, and a dough like mass remains, the fuse mixture is ready to be cured. To cure, simply place the dough-like material onto any shallow pan or tray and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams of stainless steel shot of 10 millimeters in diameter, and then tumble the mixture for about 1 hour at 150 RPM to form a uniform powdered mixture. Thereafter, the fuse powder is ready to be used. To do so, it needs to be pressed into any desirable fuse casing using high pressure or similar means.

Burn rate: Very slow burn rate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 7 ½
Tendency to cake: Less likely then ordinary black powder.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***41% Brazilian natural rubber, 27.3% charcoal, 13.6% glass, 13.6% potassium chlorate, 4.1% ammonium bisulfide, 0.40% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in making time fuses for a variety of applications.

02-01-006A: Pyrotechnic composition for time fuses:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***100 grams of powdered soft wood charcoal,*** followed by ***50 grams of glass powder,*** followed by ***50 grams of potassium chlorate,*** followed by ***150 grams of Indian rubber,*** followed by 175 milliliters of hexane, and then thoroughly blend the mixture until the bulk of the hexane evaporates. Thereafter, add in ***50 grams of carbon disulfide***, and then continue to blend the mixture until a tough, waxy paste remains. When a pasty-like mass remains, the fuse mixture is ready to be used. To use, simply press the paste into any desirably fuse casing using high pressure or similar means.

Burn rate: Very slow burn rate.
Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 4

Ease of ignition (1 to 10): 6+

Tendency to cake: Less likely then ordinary black powder.

Explosive ability: Cannot be detonated under normal conditions.

Percentage: ***37.5% Indian rubber, 25% soft wood charcoal, 12.5% potassium chlorate, 12.5% glass, 12.5% carbon disulfide***

Classification: Deflagrating explosive (classified as propellant)

Use: Used in making short time fuses for detonators and other delay elements.

02-01-007A: Nitrocellulose containing pyrotechnic composition for fuses (gasless):

Into a ball mill, filled with 500 grams of light steel shot, place ***410 grams of lead tetraoxide,*** followed by ***330 grams of potassium nitrate,*** followed by ***260 grams of finely divided silicon,*** followed by ***500 grams of nitrocellulose of average nitrogen content,*** followed by ***480 grams of dibutyl phthalate***, and finally followed by ***20 grams of diphenylamine***. Thereafter, tumble the mixture at 350 RPM for about 3 hours at room temperature. Thereafter, place the mixture into a beaker or any similar container, and then heat the mixture at 100 Celsius for about 8 hours. Thereafter, blend the mixture at 100 Celsius for about 5 minutes. Thereafter, the mixture is ready for extruding. To do so, the mixture should be extruded through time fuse of any desired diameter, or the mixture can be pressed into pellets or rods for use in mechanical fuses of the usual operation.

Burn rate: Slow.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): Typical

Ease of ignition (1 to 10): 6 ¾

Tendency to cake: None.

Explosive ability: Cannot be detonated under normal conditions.

Percentage: ***25% nitrocellulose, 24% dibutyl phthalate, 20.5% lead tetraoxide, 16.5% potassium nitrate, 13% silicon, 1% diphenylamine,***

Classification: Deflagrating explosive (classified as propellant).

Use: used for making times fuses, and for use in mechanical fuses.

02-01-008A: Modified "high reduced burn" black powder composition:

Into a suitable ball mill, or vertical mixer, filled with 250 grams of steel shot, preferably Teflon coated, place ***10 grams of alpha-napthyl amine***, followed by ***320 grams of potassium nitrate,*** followed by ***60 grams of alder wood charcoal (pre-pulverized),*** and then followed by ***120 grams of flours of sulfur***. Thereafter, add in 50 milliliters of acetone, and then followed by 75 milliliters of warm water, and then tumble the mixture at 250 RPM for about 90 minutes. Thereafter, the mixture is ready for use. To do so, the mixture needs to be extruded into time fuse cord, or pressed into tablets, pellets, or rods. The composition needs to be dried in the usual manner thereafter.

Burn rate: 400 seconds per yard.

Water resistance: Moderate.

Stability: Can be stored for many years.

Flammability (1 to 10): 5

Ease of ignition (1 to 10): 7+

Tendency to cake: None.

Explosive ability: None.

Percentage: ***62.74% potassium nitrate, 23.52 sulfur, 11.76% charcoal, 1.96% alpha-napthyl amine, 0.02% mixed residual balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in time fuse or as a delay element for multiple purposes.

02-01-008B: Modified "high reduced burn" black powder composition:

Into a suitable ball mill, or vertical mixer, filled with 150 grams of lead shot, place ***15 grams of alpha-napthyl amine***, followed by ***350 grams of potassium nitrate,*** and then followed by ***150 grams of alder wood charcoal (pre-pulverized)***. Thereafter, add in 50 milliliters of acetone, and then followed by 75 milliliters of warm water, and then tumble the mixture at 250 RPM for about 90 minutes. Thereafter, the mixture is ready for use. To do so, the mixture needs to be extruded into time fuse cord, or pressed into tablets, pellets, or rods. The composition needs to be dried in the usual manner thereafter.

Burn rate: 300 seconds per yard.

Water resistance: Moderate.

Stability: Can be stored for many years.

Flammability (1 to 10): 5+

Ease of ignition (1 to 10): 7+

Tendency to cake: None.

Explosive ability: None.

Percentage: ***67.96% potassium nitrate, 29.12% charcoal, 2.91% alpha-napthyl amine, 0.01% mixed residual balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in time fuse or as a delay element for multiple purposes.

02-01-009A: Modified black powder composition for use in time fuse and delays:

Into a suitable ball mill, or vertical mixer, containing 250 grams of lead shot, place ***375 grams of potassium nitrate***, followed by ***75 grams of soft wood charcoal,*** and then followed by ***50 grams of flours of sulfur***. Thereafter, add in 125 milliliters of 95% ethyl alcohol, and then tumble the combined mixture at 300 RPM for about 1 hour. Thereafter, add in ***230 grams of titanium dioxide***, and then continue to tumble the mixture at 300 RPM for about 1 hour. After the 1 hour tumbling process, the mixture is ready for use. To do so, the material should be pressed into any desirable time fuse cord, tube, ect., and then cure in an oven at ordinary temperatures in the usual manner.

Burn rate: 170 seconds per yard on average.

Water resistance: Average.

Stability: Can be stored for many years.

Flammability (1 to 10): 6+

Ease of ignition (1 to 10): 6+

Tendency to cake: Very low.

Explosive ability: None.

Percentage: ***51.36% potassium nitrate, 31.5% titanium dioxide, 10.27% charcoal, 6.84% sulfur, 0.03% balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Used in time fuse cord, and as a delay element for explosive munitions.

02-01-009B: Modified black powder composition for use in time fuse and delays:

As in the previous example, into a suitable ball mill, or vertical mixer, containing 300 grams of Teflon coated steel shot, place ***375 grams of potassium nitrate***, followed by ***75 grams of soft wood charcoal,*** and then followed by ***50 grams of flours of sulfur***. Thereafter, add in 125 milliliters of 95% ethyl alcohol, and then tumble the combined mixture at 300 RPM for about 1 hour. Thereafter, add in ***210 grams of manganese dioxide***, and then continue to tumble the mixture at 300 RPM for about 1 hour. After the 1 hour tumbling process, the mixture is ready for use. To do so, the material should be pressed into any desirable time fuse cord, tube, ect., and then cured in an oven at ordinary temperatures in the usual manner.

Burn rate: 115 seconds per yard on average.

Water resistance: Average.

Stability: Can be stored for many years.

Flammability (1 to 10): 6+

Ease of ignition (1 to 10): 6+

Tendency to cake: Very low.

Explosive ability: None.

Percentage: ***52.81% potassium nitrate, 29.57% manganese dioxide, 10.56% charcoal, 7.04% sulfur, 0.02% balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Used in time fuse cord, and as a delay element for explosive munitions.

02-01-009A: "Graphite" black powder composition:

Into a suitable iron, tin, steel, or bronze pot, place 2 liters of water followed by ***750 grams of potassium nitrate***, and the boil the solution using a wood fire, or steam bath. When the water begins to boil, gently stir in ***150 grams of finely divided graphite***, followed by ***120 grams of flours of sulfur***, and then continue to boil the mixture. Note: the mixture should be continuously stirred using a wood spatula all through out the boiling process. Continue to boil the mixture until about 98% of the water has been evaporated, and only a pasty thick mass exists. When this point is achieved, remove the pot from the heat source, and allow its contents to cool to room temperature. Note: during this cool down period, continuously stir the pasty mixture with a wooden spatula. Once the mixture has cooled to room temperature, lay out the mixture out on a shallow pan and allow it to thoroughly dry. Once the mass is dry, it can then be pulverized into different grain sizes that can be separated using desired sieves or screens.

Burn rate: Depends on grain size (granules 1 to 12 millimeters are suitable for firearms, mortars, and cannons, and fine powder can be used as blasting agent).

Water resistance: Moderate.

Stability: Can be stored for many years.

Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9

Tendency to cake: May cake on prolonged exposure to moisture.

Explosive ability: Cannot be detonated under normal conditions.

Percentage: ***74% potassium nitrate, 14% graphite, 12% sulfur***

Classification: Deflagrating explosive (classified as propellant).

Use: Suitable for use in firearms, mortars, cannons, and in blasting agents.

02-01-009B: "Graphite" black powder composition (modified):
Into a suitable ball mill containing 300 grams of steel shot of 5 millimeters in diameter, followed by ***750 grams of potassium nitrate***, followed by ***150 grams of finely divided graphite***, followed by ***120 grams of flours of sulfur***, and then followed by 75 milliliters of 95% ethyl alcohol, or 75 milliliters of denatured alcohol, and then tumble the mixture at 500 RPM for about 2 hours. After 2 hours, remove the mixture, and place it onto a shallow pan and allow it to thoroughly air-dry. When the mass is completely dry, pulverize the mass and then separate the different grain sizes using the usual sieve sizes or screens. If desired, you can place the dry mass into a ball mill filled with clean steel shot of 10 millimeters in diameter and tumble the mixture for 2 hours at 250 RPM to form a uniform finely divided powder.
Burn rate: Depends on grain size (well suitable for fire crackers and other "pop" fireworks).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Less likely then ordinary black powder.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***74% potassium nitrate, 14% graphite, 12% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in fireworks.

02-01-010A: Thermally stable modified black powder composition:
Into a suitable ball mill containing 175 grams of Teflon coated steel shot of 5 millimeters in diameter, followed by ***300 grams of sodium nitrate***, followed by ***50 grams of flours of sulfur***, followed by ***50 grams of ammonium nitrate***, followed by ***89 grams of regular charcoal,*** followed by ***6 grams of calcium carbonate***, and then followed by ***5 grams of urea.*** Thereafter, throw in 75 milliliters of hexane, and then rotate the mixture at 250 RPM for about 2 hours at room temperature. After 2 hours, remove the mixture, and place it onto a shallow pan and allow it to thoroughly air-dry. When the mass is completely dry, place the dry mass into a ball mill filled with clean steel shot of 10 millimeters in diameter and tumble the mixture for 2 hours at 250 RPM to form a uniform finely divided powder.
Burn rate: Depends on grain size.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Less likely then ordinary black powder.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***60% sodium nitrate, 17.8% charcoal, 10% sulfur, 10% ammonium nitrate, 1.2% calcium carbonate, 1% urea***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in fireworks.

02-01-011A: Reduced chamber pressure modified black powder suitable for small arms:
Into a standard ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters of diameter, place ***225 gram of potassium nitrate***, followed by ***45 grams of finely divided hard wood charcoal***, followed by ***30 grams of flours of sulfur***, followed by ***95 grams of potassium perchlorate***, followed by ***55 grams of sodium benzoate***, followed by ***30 grams of dicyandiamide***, and then followed by ***20 grams of dextrin***. Thereafter, tumble the mixture at 150 RPM for about 30 minutes. After 30 minutes, slowly add in, in the form of a spray, 60 milliliters of water while continuing to tumble the mixture at 150 RPM. Once all the water has been added, throw in about ***2.5 grams of standard wax***, followed by ***2.5 grams of finely divided graphite***, and then continue to tumble the mixture at 150 RPM for about 1 hour at room temperature. After 1 hour, the mixture is ready. To use, it should be removed from the ball mill, and placed onto a shallow tray and allowed to air-dry for several days. Thereafter, the dried mass should be screened through any desirable mesh screen to form various grain sizes; however, a more convenient method of forming granules is to utilize the solvent evaporation technique. To do so, place the entire dried mass into any suitable mixing drum or blender, equipped with motorized stirrer equipped with plastic stir blade, and then add 250 milliliters of 95% alcohol, and then blend the mixture on moderate speed until the alcohol has evaporated to the point where only a wet tacky paste remains. Now, once the paste has formed, continue mixing until the pasty mass begins to dry and form into tiny balls or granules—this granulation technique will proceed as the solvent evaporates to near dryness. The size of the granules is dependant on how long you continue to blend the mixture once the original bulky paste has formed, and the speed at which your blending takes place. The longer you continue to blend the mixture, the more solvent evaporates. The more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste, the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the paste, on low speed until the mixture is near dryness. Either way, once your desired granules have formed, stop the blending operation, and then allow the granules to cure in an oven at 60 Celsius until completely dry. To use the grains, simply place them (loosely) into any desirable shell casing, or they can be used directly in "black powder" muzzle loaded weapons.

Burn rate: Rapid.
Chamber pressure: 7800 psi at 80 grains
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44.5% potassium nitrate, 18.8% potassium perchlorate, 10.8% sodium benzoate, 8.9% hard wood charcoal, 5.9% of sulfur, 5.9% dicyandiamide, 3.9% dextrin, 0.49% wax, 0.49% graphite, 0.32% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in small arms weapons mainly for pistols and shotguns, and also in grenade launchers.

02-01-012A: Modified black powder composition utilizing cellulose fibers for added stability and energy output:
Into a suitable mixing bowl, blender or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***300 grams of potassium nitrate***, followed by ***200 grams of cellulosic fibers*** commercially available and designated as KS1016, available from the James River Corporation, and then add in 175 to 200 milliliters of cold water, and then blend the mixture to form a slurry or paste. Thereafter, into a separate mixing bowl, beaker, or equivalent, place ***300 grams of potassium nitrate***, followed by ***200 grams of erythorbic acid***, and then add in 2400 milliliters of warm water, and then stir the mixture manually to form a clear solution. Note: if all the solids fail to dissolve, add in some more water until they do. Thereafter, pour this clear solution into the mixing bowl containing the potassium nitrate/cellulose mixture, and then blend the mixture on high for about 1 hour. After 1 hour, pour the entire mixture onto a shallow pan, and then allow it to thoroughly air-dry for several days or so. Once a dry material is obtained, place the dried mass into a clean mixing bowl or equivalent, and then add in 500 milliliters of acetone, and then blend the mixture until most of the acetone evaporates, and a pasty-like mass is obtained. Now, like in previous granulation processes, the size of the granules is dependant on how long you continue to blend the mixture once the original bulky paste has formed, and the speed at which your blending takes place. The longer you continue to blend the mixture, the more solvent evaporates. The more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste, the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the paste, on low speed until the mixture is near dryness. Either way, once your desired granules have formed, stop the blending operation, and then allow the granules to cure in an oven at 50 to 60 Celsius until completely dry. To use the grains, simply place them (loosely) into any desirable shell casing, or they can be used directly in "black powder" muzzle loaded weapons.
Burn rate: Rapid.
Chamber process: Average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% potassium nitrate, 20% cellulose, 20% erythorbic acid***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in small arms weapons of the usual type.

02-01-012B: Modified black powder composition utilizing cellulose fibers for making consumable gun case cartridges:
Into a suitable mixing bowl, blender or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***300 grams of potassium nitrate***, followed by ***200 grams of cellulosic fibers*** commercially available and designated as KS1016, available from the James River Corporation, and then add in 175 to 200 milliliters of cold water, and then blend the mixture to form a slurry or paste. Thereafter, into a separate mixing bowl, beaker, or equivalent, place ***300 grams of potassium nitrate***, followed by ***200 grams of erythorbic acid***, and then add in 2400 milliliters of warm water, and then stir the mixture manually to form a clear solution. Note: if all the solids fail to dissolve, add in some more water until they do. Thereafter, pour this clear solution into the mixing bowl containing the potassium nitrate/cellulose mixture, and then blend the mixture on high for about 1 hour. After 1 hour, pour the entire mixture onto a shallow pan, and then allow it to thoroughly air-dry for several days or so. Once a dry material is obtained, it needs to be pressed into pre fabricated gun cartridge molds under a pressure of 10,000 to 14,000 psi. Note: a heated mold, heated between 40 and 60 Celsius is preferred to aid in flow compaction during the pressing process. Once the gun cartridges are formed, they can be filled with any suitable gun propellant powder or granules, fitted with suitable and proper gun primer, and then capped with bullet or projectile. The primer and bullet or projectile bodies can be secured to the gun cartridge by using any average acetone based rubber cement composition or binder (modelers cement), followed by drying. Thereby the munition is ready for firing.

Burn rate: Rapid.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% potassium nitrate, 20% cellulose, 20% erythorbic acid***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in forming metal-less, totally consumable gun cartridge cases thereby decreasing weight of overall ammunition without sacrificing force.

02-01-013A: Modified black powder composition utilizing coated sodium nitrate:
Into a suitable empty ball mill, place ***360 grams of dry sodium nitrate***, and then add in ***2.5 grams of powdered graphite***, and then tumble the mixture for about 12 hours. Note: sealing the ball meal to protect it from moisture is recommended. After 12 hours, the sodium nitrate will be properly coated. Now, add in ***60 grams of finely powdered sulfur***, followed by ***80 grams of standard soft wood charcoal***, and then add in 150 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 50 RPM for about 12 hours. After 12 hours, the powder is ready for loading. To do so, it simply needs to be poured into any desirable black powder riffle, cannon, ect, utilizing the normal techniques, or it can be loaded into shell casings, and then tapped with a bullet, utilizing the normal techniques.
Burn rate: Average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***71.6% sodium nitrate, 15.9% charcoal, 11.9% sulfur, 0.49% graphite, 0.11% mixed impurities***
Classification: Deflagrating explosive (classified as propellant)
Use: Can be used in black powder riffles and cannons of the usual diameter.

02-01-014A: Basic modified black powder composition for use in canons:
Into a suitable beaker of similar container, place ***544 grams of gum Arabic***, and then add in 1080 milliliters of water, and then stir the entire mixture for about 10 minutes to dissolve the gum Arabic. Thereafter, prepare a second solution by placing into another suitable sized beaker or similar container, ***136 grams of potassium nitrate***, followed by 2700 milliliters of warm water, and then stir the mixture to dissolve all the nitrate. Thereafter, mix both solutions, and stir the combined mixture for about 30 minutes. Thereafter, slowly add in, drop wise, over a period of about 30 to 40 minutes, 550 milliliters of 95% ethyl alcohol, while stirring the gum Arabic/nitrate mixture. After the addition of the alcohol, stir the mixture for about 30 minutes, and then filter-off the precipitated mass, and then press it or extrude it from any desirable extruding machine in the usual manner. If desired, the filtered-off mass can be pressed directly into cakes, or molds of various sizes for forming single solid propellant cakes that can be loaded directly into any desirable cannon. Note: the excess gum Arabic and alcohol mixture can be recycled by distilling-off the alcohol, and then allowing the remaining solution to evaporate to recover the gum Arabic.
Burn rate: Average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% potassium nitrate, 25% gum Arabic***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in black powder cannons. Not suitable for use in riffles.

02-01-015A: Modified black powder composition with increased burn rate:
Into a mortar or pestle, place ***750 grams of potassium nitrate***, followed by ***150 grams of sodium benzoate***, followed by ***100 grams of flours of sulfur***, and then gently blend the mixture with the pestle for about 1 hour or less to form a uniform powder. Thereafter, the mixture should be ball milled in a suitable ball mill, minus the steel shot at 150 RPM for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be loaded into any desirable shell casing in the usual manner.
Burn rate: Average.
Water resistance: Moderate.

Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% potassium nitrate, 15% sodium benzoate, 10% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in handguns in general and mainly in .44, and .45 caliber shells

02-01-016A: Specialty modified black powder composition:
Into a suitable ball mill, filled with 250 grams of lead shot, place ***360 grams of lead nitrate***, followed by ***90 grams of flours of potassium chlorate***, and then followed by ***50 grams of nitro starch***. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Note: During the 2-hour mixing process, spray into the ball mill, in small portions at a time, 50 milliliters of butyl acetate. After the 2-hour mixing period, the mixture is ready for extrusion. To do so, the material should be pressed through any desired die cast machine, into spaghetti like strands of 2 to 3 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the spaghetti like strands should be cut into lengths of 1.5 to 3 millimeters. Finally, the grains should be cured in an oven at normal temperature. The cured grains can then be poured into shell casings for use in standard ammunition, or can be placed into baggies for use in canons or the like. If desired, the final material can be thoroughly dried, and then pulverized in a separate mill to form a fine powder.
Burn rate: Average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72% lead nitrate, 18% sulfur, 10% nitro starch***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty sporting ammunition such as handguns and shotguns.

02-01-017A: Reduced burn black powder composition for various uses:
Into a suitable ball mill, or vertical mixer, filled with 200 grams of Teflon coated steel shot, place ***364 grams of pre-dried sodium nitrate***, followed by ***48.5 grams of flours of sulfur***, followed by ***72.5 grams of soft wood charcoal (pre-pulverized)***, and then followed by ***15 grams of standard commercial rosin***. Thereafter, add in 100 milliliters of ether, and then tumble the mixture at 300 RPM for about 1 hour. Note: During the mixing process, the ball mill or vertical mixer should be kept closed to prevent evaporation of the solvent. Thereafter, the mixture is ready for use. To do so, the mixture can be extruded through any desired die cast machine, formed into grains using any desired method, pressed into time fuse, tablets, pellets, or formed into any desired means if desired. In any case, the mixture should be cured in an oven at normal temperature or dried under vacuum to recover the solvent.
Burn rate: Average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 7 to 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.8% sodium nitrate, 14.5% charcoal, 9.7% sulfur, 3% rosin***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in fireworks, for small arms ammunition, time fuse, or another desired means.

02-01-017B: Reduced burn black powder composition for various uses:
Into a suitable ball mill, or vertical mixer, filled with 200 grams of Teflon coated steel shot, place ***364 grams of pre-dried potassium nitrate***, followed by ***48.5 grams of flours of sulfur***, followed by ***72.5 grams of hard wood charcoal (pre-pulverized)***, and then followed by ***15 grams of gum Arabic***. Thereafter, add in 100 milliliters of 95% ethyl alcohol, and then tumble the mixture at 300 RPM for about 1 hour. Thereafter, the mixture is ready for use. To do so, the mixture can be extruded through any desired die cast machine, formed into grains using any desired method, pressed into time fuse, tablets, pellets, or formed into any desired means if desired. In any case, the mixture should be cured in an oven at normal temperature.
Burn rate: Average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 7 to 8

Tendency to cake: None.
Explosive ability: None.
Percentage: *72.8% potassium nitrate, 14.5% charcoal, 9.7% sulfur, 3% gum Arabic*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in fireworks, for small arms ammunition, time fuse, or any other desired means.

02-01-018A: Modified "high reduced burn" black powder composition:
Into a suitable ball mill, or vertical mixer, filled with 200 grams of Teflon coated steel shot, place *10 grams of alpha-napthyl amine*, followed by *375 grams of potassium nitrate,* followed by *85 grams of alder wood charcoal (pre-pulverized),* and then followed by *40 grams of flours of sulfur*. Thereafter, add in 100 milliliters of 95% ethyl alcohol, and then tumble the mixture at 300 RPM for about 1 hour. Thereafter, the mixture is ready for use. To do so, the mixture can be extruded through any desired die cast machine, formed into grains using any desired method, pressed into time fuse, tablets, pellets, or formed into any desired means if desired. In any case, the mixture should be cured in an oven at normal temperature.
Burn rate: Unknown.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *73.52% potassium nitrate, 16.66% charcoal, 7.84% sulfur, 1.96% alpha-napthyl amine, 0.02% mixed residual balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in fireworks, for small arms ammunition, time fuse, or any other desired means.

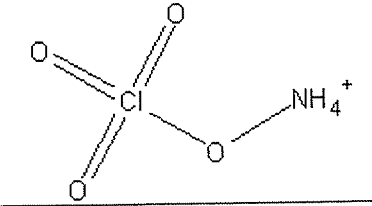
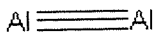
02-01-019A: Modified "reduced burn" black powder composition:
Into a suitable ball mill, or vertical mixer, filled with 200 grams of steel shot, place *370 grams of potassium nitrate*, followed by *47.5 grams of flours of sulfur,* and then followed by *82.5 grams of carbon black*. Thereafter, add in 175 milliliters of 95% ethyl alcohol, and then tumble the mixture at 500 RPM for about 1 hour. Thereafter, the mixture is ready for use. To do so, the mixture can be extruded through any desired die cast machine, formed into grains using any desired method, pressed into time fuse, tablets, pellets, or formed into any desired means if desired. In any case, the mixture should be cured in an oven at normal temperature.
Burn rate: 40+ seconds per yard on average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: *74% potassium nitrate, 16.5% carbon black, 9.5% sulfur*
Classification: Deflagrating explosive (classified as propellant)
Use: Can be used in fireworks, for small arms ammunition, time fuse, or any other desired means.

02-01-020A: Modified "reduced burn" black powder composition:
Into a suitable ball mill, or vertical mixer, filled with 350 grams of Teflon coated steel shot, place *370 grams of potassium nitrate*, followed by *52 grams of flours of sulfur,* followed by *46.8 grams of soft wood charcoal,* and then followed by *31.2 grams of finely ground "sugar" carbon*. Thereafter, add in 150 milliliters of 95% ethyl alcohol, and then tumble the mixture at 300 RPM for about 1 hour. Thereafter, the mixture is ready for use. To do so, the mixture can be extruded through any desired die cast machine, formed into grains using any desired method, pressed into time fuse, tablets, pellets, or formed into any desired means if desired. In any case, the mixture should be cured in an oven at normal temperature.
Burn rate: 35 seconds per yard on average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *74% potassium nitrate, 10.4% sulfur, 9.36% soft wood charcoal, 6.24% sugar carbon*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in fireworks, for small arms ammunition, time fuse, or any other desired means.

3. High Performance Rocket Propellants

Section 1: Ammonium Perchlorate Rocket Propellants

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)		**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)		**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)		**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)		**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)		**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)		**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)		**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)		**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)		**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)		**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)		**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate		**24. Aluminum powder**
		
Ammonium perchlorate forms colorless orthorhombic crystals or white powder. The crystals decompose when heated into oxygen and ammonium chloride. The crystals are very soluble in water. Ammonium perchlorate has limited use in explosive compositions, but its use in propellants is overwhelming. Ammonium perchlorate is heavily used in solid rocket propellants when mixed with aluminum or other metals or reducing agents and a polymer binder. The salt is a strong oxidizer, and should be kept away from combustible materials and sources of possible ignition. Note: A disastrous explosion in the Nevada desert in the late 1980's was a result of poor containment and storage of ammonium perchlorate crystals. As expected, mixtures of APC and any combustible agent ignite rapidly and violently. Store ammonium perchlorate in tightly sealed bottles in a cool place, and away from sunlight.		Aluminum powder is a tin-white substance with a somewhat bluish tint. The powder is stable in dry air, but easily ignites upon ignition. The powder will easily oxidize when heating in air.
Method of Preparation 1: Dissolve 470 grams of sodium perchlorate into 1000 milliliters water. Then quickly add 320 grams of a 28 - 30% ammonia solution, or 900 grams of 10% ammonia solution, or pass 96 grams of anhydrous ammonia gas into the perchlorate solution while stirring the sodium perchlorate solution. Afterwards, Cool the mixture to 0 Celsius by means of an ice bath. Then bubble 1300 grams of dry carbon dioxide gas into the mixture over a several hour period while keeping the reaction temperature at 0 Celsius and stirring, or add in pieces, 1000 grams of		

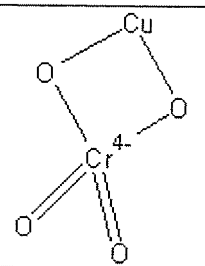
dry ice. During the carbon dioxide gas addition, sodium bicarbonate will slowly precipitate (if dry ice is used, precipitation of the sodium bicarbonate will be more rapid). After all the carbon dioxide has been added, continue to stir the reaction mixture for 90 minutes at 0 Celsius, and then filter the reaction mixture to remove the insoluble sodium bicarbonate. After filtration, recrystallize the ammonium perchlorate from the filtered mixture at 100 Celsius. Note: during the recrystallization process, do not over recrystallize. This means when most of the ammonium perchlorate has been collected by filtration, do not boil-off all the remaining water to the point where dry solid remains. Dry ammonium perchlorate may decompose if heated above 70 Celsius. If boiling the mixture at 100 Celsius during the recrystallization process causes some decomposition of the ammonium perchlorate, place the filtered reaction mixture into a shallow pan, and heat the pan at 50 Celsius while blowing air over the surface of the liquid. Do this until dry solid remains (a small portable cooling fan can be used). Note: If a rotary evaporator is available, place the filtered reaction mixture there into, and then remove the water under high vacuum until dry solid remains.

25. Magnesium Sulfide

$Mg{=}S$

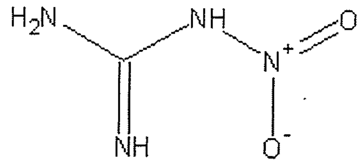
Magnesium sulfide forms reddish-brown crystals.

26. Copper Chromite



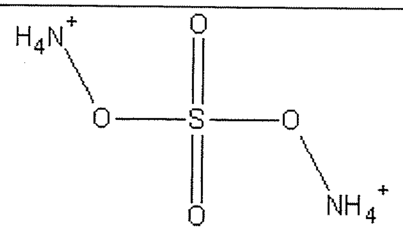
Forms grayish to black tetragonal crystals. The crystals are insoluble in water and the usual solvents, Upon heating to high temperatures, the crystals decompose into chromium dioxide and chromium trioxide.

27. Nitroguanidine



Nitroguanidine forms white or colorless needles, or prisms, which begin to decompose when heated to 225 Celsius—evolving ammonia. The crystals are insoluble in water and alcohol, but soluble in concentrated acids, from where the corresponding acid salt is precipitated by pouring into cold water—the nitrate and perchlorate salts are quite common and are used n fireworks, and a variety of pyrotechnic compositions. Nitroguanidine usually occurs as the alpha form, but the beta form can be prepared by treating guanidine sulfate with 90% nitric acid. The beta form is converted back to the alpha form by treatment with sulfuric acid, from which the sulfate salt is precipitated by pouring into cold water—the fee base (nitroguanidine) is then liberated by treating the sulfate with sodium carbonate. The freebase is slowly decomposed in alkali solutions.

28. Ammonium Sulfate

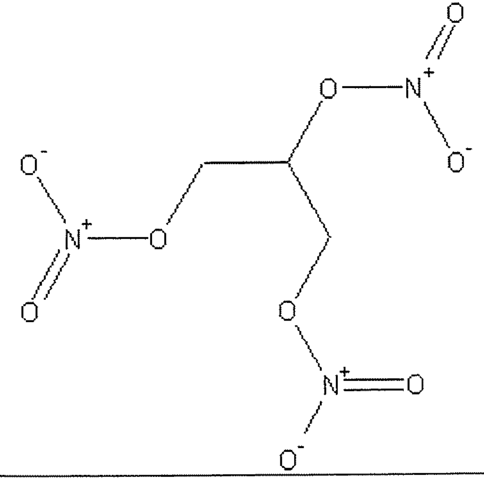


Forms odorless crystalline powder, granules, or masses. The salt decomposes when heated to 280 Celsius. The salt is soluble in water, but insoluble in the usual organic solvents. It can be made by dissolving ammonia into dilute sulfuric acid.

Nitroguanidine is used primarily in the perpetration of other explosives, but it can be used in explosive compositions when alloyed with TNT, RDX, HMX, or other secondary explosives. Nitroguanidine requires a significant detonator or booster for initiation. Nitroguanidine is also widely used in rocket propellants, and gun propellants.

Method of Preparation 1: Place 900 grams of 98% sulfuric acid into a flask, and cool to 0 Celsius by means of an ice bath. When the temperature reaches 0 Celsius, slowly add 120 grams of guanidine in small portions while keeping the 98% sulfuric acid cooled to 0 Celsius and stirring. After the addition of the guanidine, slowly add drop wise, 184 grams of 70% nitric over a period of 1 hour while keeping the reaction mixtures temperature at 0 Celsius and stirring. After addition of the 70% nitric acid, pour the entire reaction mixture onto 1 kilogram of ice, which is contained in a large beaker. After the ice has melted, filter-off the precipitated product, and then wash with 1000 milliliters of cold water. Then vacuum dry, air dry, or dry the product in an oven at 80 Celsius for about 1 hour, or until dry.

29. Nitroglycerine

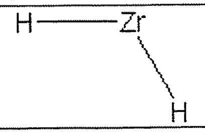


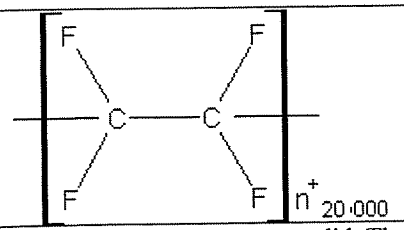
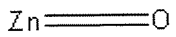
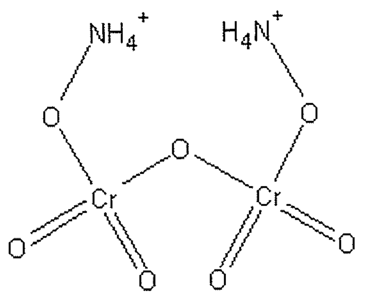
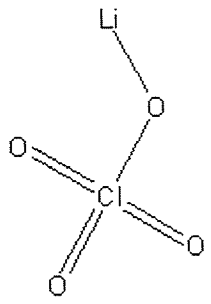
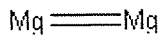
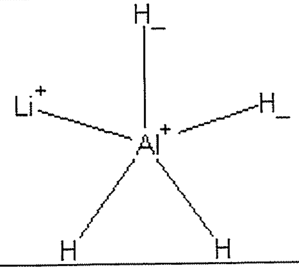
Nitroglycerine is a pale yellow, oily liquid, which explodes on rapid heating or on percussion—nitroglycerine still requires a primary explosive for initiation under most conditions. Nitroglycerine begins to decompose when heated to about 50 Celsius—where upon reddish fumes develop, and shortly thereafter it may detonate. The pure liquid becomes volatile when gently heated to 100 Celsius, but will decompose if rapidly heated to 50+ Celsius with evolution of reddish fumes followed by explosion. Nitroglycerine detonates when gently heated to 218 Celsius—producing a violent flash and loud bang. It is insoluble in water, but miscible with acetone, ether, benzene, ethyl acetate, and chloroform. Pure nitroglycerine can safely be stored in a refrigerator, and protected from light. For prolonged storage, it is best to store nitroglycerine in an inert solvent such as acetone—whereby the nitroglycerine can be separated as an oily insoluble layer upon the addition of cold water. Nitroglycerine is widely used in propellant compositions for smokeless gun powders, high performance rocket compositions, and high performance gun propellants. Nitroglycerine is also commonly used in dynamites when mixed with inert fillers. The use of nitroglycerine in explosives has decreased due to

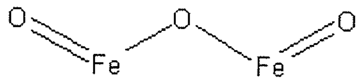
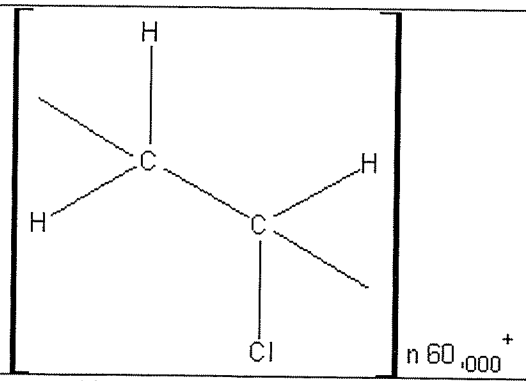
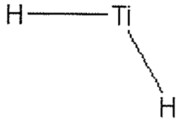
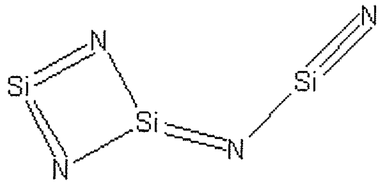
30. Magnesium Oxide

$Mg{=}O$

Magnesium Oxide forms a nice fine white powder that exists in two forms: light, and heavy. Both forms absorb carbon dioxide from the air, and react with water to form magnesium hydroxide. Magnesium oxide is prepared by roasting magnesium carbonate.

several main factors: 1) its difficult to handle in the since that it causes severe headaches, 2) it's stability has been in question as the result of several accidents—however these accidents where the result of poor conditions, and 3) its explosive power is quite high, and this results in tendency to cause cave-ins and unsatisfactory rock fracturing; as a result, its use in mining operations and engineering projects has been decreased. Note: Ammonium nitrate has replaced nitroglycerine in most mining explosives due to lesser power, and more convenient methods of handling and storage. In any regards, nitroglycerine is still a cheap and readily available material for use in military, or commercial explosives.	
Method of Preparation 1: Prepare a nitrating acid mixture by adding 128 grams of 98% sulfuric acid into 118 grams of 90% nitric acid, and then cool the acid mixture to 10 Celsius by means of an ice water bath. Then begin stirring the acid mixture. While stirring the acid mixture, slowly add drop wise, 40 grams of glycerol over a period sufficient to keep the nitrating acid mixture at 10 Celsius. After addition of the glycerol, stir the reaction mixture for 2 hours while keeping the temperature at 10 Celsius. After stirring for 2 hours, gently pour the reaction mixture onto 1000 grams of ice (note: use care as sulfuric acid generates excessive heat when applied to water or ice—monitor the temperature as the reaction mixture is poured onto to the ice—excessive heat buildup can result in violent decomposition of the nitroglycerine) contained in a suitable beaker or vessel, and then allow the entire mixture to stand for 1 hour. Then pour the entire mixture into a separatory funnel, and then remove the upper nitroglycerine layer. Then wash this nitroglycerine layer by mixing it with 500 milliliters of a 5% sodium bicarbonate solution, and then place this entire mixture into a clean separatory funnel, and remove the lower nitroglycerine layer (in some cases the nitroglycerine will be the upper layer). Then wash the nitroglycerine layer with 500 milliliters of ice-cold water, and then place the mixture into a clean separatory funnel, and then remove the lower nitroglycerine layer. Finally, add to the nitroglycerine layer, 50 grams of anhydrous magnesium sulfate (to absorb water), and then stir for several minutes, then filter-off the magnesium sulfate, and then place the nitroglycerine into an amber glass bottle and store in a refrigerator until use.	
31. Iron-II-oxide	**32. Zirconium Hydride**
	
Ferrous oxide forms a jet-black powder, which readily absorbs carbon dioxide from the air. The dry solid is insoluble in water and all organic solvents, but the dry powder readily dissolves in acids.	Forms a grayish-black powder, which is stable towards water. It is formed by reacting calcium hydride with zirconium oxide in the presence of hydrogen gas at 600 Celsius. A powerful reducing agent.
33. Teflon	**34. Zinc Oxide**

	
Teflon is a white translucent to opaque solid. The solid is almost resistant to all chemicals, and is widely used for industrial and commercial applications. The powered solid melts when heated to 327 Celsius forming a viscous gel, which volatizes when heated to 400 Celsius. Teflon is insoluble in all known solvents. Although Teflon is chemical resistant, in powdered form it is capable of acting as an energy source in pyrotechnic compositions, specifically high performance rocket propellants.	White or slightly yellowish to light brown powder. Zinc oxide is insoluble in water and most organic solvents, but does dissolve in acids and alkaline solutions. It can be made by roasting zinc carbonate or hydroxide.
35. Ammonium Dichromate	**36. Lithium Perchlorate**
 NH_4^+ H_4N^+ O O O Cr Cr O O O O	
The dichromate forms beautiful bright orange-red crystals. The crystals are flammable. Ammonium dichromate is readily soluble in water, but not readily soluble in the usual solvents. The crystals decompose when heated to 180 Celsius, and the decomposition becomes self-sustained when heated to 225 Celsius. The product can be prepared by reacting ammonium sulfate solution with sodium dichromate, followed by recrytsallization.	Lithium perchlorate forms colorless to white crystals, granules, or powder. The crystals begin to decompose when to 400+ Celsius, but the crystals will melt when gently heated to 236 Celsius. Lithium perchlorate is one of the most soluble salts in water, and is very soluble in ether, alcohol, and acetone.
37. Magnesium powder	**38. Lithium Aluminum Hydride**
	
Magnesium powder forms a white to silvery white powder with hexagonal system. The powder is readily flammable and burns producing intense light. The solid is insoluble in water and all organic solvents; however the powder will slowly react with water at ordinary temperatures. Magnesium powder readily oxidizes when heated or ignited.	White to light gray solid. The dry solid is very reactive and reduces many organic compounds. Lithium Aluminum Hydride is prepared by reacting ether solutions of lithium hydride and anhydrous aluminum chloride.
39. Iron-III-oxide (red iron oxide)	**40. PVC**

	
Red Iron oxide is formed by roasting ferrous hydroxide, oxides, or hydrates at red heat. The compound is insoluble in water, and becomes insoluble in acids when roasted at high temperatures for prolonged periods of time. The oxide can act as a secondary source of oxygen in pyrotechnic mixtures.	PVC forms a white to translucent solid, which discolors in the presence of light, so commercial grades often contain stabilizers not desired for use in pyrotechnic compositions. The solid is obtained by the polymerization of vinyl chloride using various catalysts. The solid is readily soluble in cylcohexanone, tetrahydrofuran, and methylene chloride.
41. Copper Sulfide	**42. Sodium Hydride**
Cu═S	Na—H
Copper sulfide forms a black powder, which is stable in dry air, but is slowly oxidized to copper sulfate in moist air. The dry solid is insoluble in water, and all organic solvents.	Sodium hydride forms a grayish-white powder. It is very reactive and reacts vigorously with water, and many other chemicals. It is prepared by heating metallic sodium in a stream of hydrogen under inert atmosphere.
43. Titanium Hydride	**44. Silicon Nitride**
	
Titanium Hydride forms a grayish-black powder, which is relatively stable towards moisture and air. Titanium hydride is prepared by heating titanium oxide with calcium hydride in the presence of hydrogen at 600 Celsius.	Silicon nitride is a white, to brownish-black powder that exists in two forms—differentiated by heating. Silicon nitride is very resistant to heat and forms a non-oxide ceramic material.

- High Performance Ammonium Perchlorate Propellants in this section -

1. 03-01-001A: High Performance Military grade rocket propellant: *68.13% ammonium perchlorate, 16.03% aluminum, 15.53% kraton polymer binder, 0.30% aziridine resin, 0.01% impurities*	**2. 03-01-002A: High Performance Military grade rocket propellant:** *74.77%% ammonium perchlorate, 15.95% dioctyl adipate binder, 8.47% RB-100 resin, 0.79% lecithin catalyst, 0.02% impurities*
3. 03-01-003A: High Performance Military grade rocket propellant with PVC: *78.43% ammonium perchlorate, 19.6% PVC polymer, 0.98% Epon 815 epoxy resin, 0.98% magnesium sulfide catalyst, 0.01% impurities*	**4. 03-01-004A: High Performance military rocket propellant (JPL X500 type):** *77.8% ammonium perchlorate, 11% dioctyl azelate, 6.6% hexane triol plasticizer, 1.6% 2,4-toluene diisocyanate, 1.5% poly propylene glycol plasticizer, 1.1% copper chromite burn rate accelerator, 0.05% ferric acetylacetonate curing catalyst, 0.35% impurities*
5. 03-01-005A: High Performance military rocket propellant: *70% ammonium perchlorate, 18.6% aluminum, 5.4% ploy-1,2-butylene glycol plasticizer, 4% hexamethylene diisocyante curative, 1.2% polyoxypropylene derivative of trimethylolpropane curative, 0.10% sulfur, 0.70% moisture*	**6. 03-01-006A: High Performance military rocket propellant (with negative pressure exponent):** *58.2% ammonium perchlorate, 18% ammonium sulfate, 14% poly propylene glycol plasticizer, 6% dioctyl adipate, 1.5% 2,4-toluene diisocyanate, 1.2% poly propylene glycol adduct of trimethylol propane, 0.75% triethylamine catalyst, 0.05% ferric acetylacetonate curing catalyst, 0.30% impurities*
7. 03-01-007A: High Performance military rocket propellant (reduced flash): *32% ammonium perchlorate, 26.4% nitroguanidine, 21.9% polyethylene glycol binder, 12.7% aluminum, 6.3% ammonium nitrate, 0.70% impurities*	**8. 03-01-008A: High Performance polymeric military rocket propellant:** *68% ammonium perchlorate, 16% aluminum, 11.8% polybutylene glycol diamine, 4.1% epoxy resin D.E.R. 332, 0.10%, residue*
9. 03-01-009A: High Performance "plateau-burning" polymeric rocket propellant: *75% ammonium perchlorate, 20.4% polybutyl acrylic acid binder, 3.6% epon 828 epoxy resin, 1% lithium fluoride stabilizer*	**10. 03-01-010A: High Performance polymeric rocket propellant:** *62.2% ammonium perchlorate, 17.2% aluminum, 12.6% diglycidyl ether polypropylene glycol binder, 6.4% diglycidyl ether bisphenol A binder, 1.1% monoethanolamine catalyst, 0.21% diethylentriamn curing catalyst, 0.29% residue*
11. 03-01-010A: High Performance polymeric rocket propellant (modified with increased burn rate—aluminum free): *75.2% ammonium perchlorate, 15.3% diglycidyl ether polypropylene glycol binder, 7.7% diglycidyl ether bisphenol A binder, 1.4% monoethanolamine catalyst, 0.25% diethylentriamn curing catalyst, 0.15% residue*	**12. 03-01-011A: High Performance polyurethane rocket propellant:** *73% ammonium perchlorate, 15% aluminum, 7.1% polybutadiene diol binder, 3.9% dioctylsebacate plasticizing agent, 0.4% 2,6,-toluene diisocyanate, 0.3% polyprpylene oxide triol binding agent, 0.15% nickel-II-hydroxide curing agent, 0.08% residue, 0.05% dihydroxypropyl bis(cyanoethylamine curing catalyst, 0.02% ferric acetylacetonate*
13. 03-01-012A: High Performance CMDB rocket propellants (composite modified Double Base propellants): *49% ammonium perchlorate, 26% nitroglycerine, 14% aluminum, 4.6% triacetin, 4% plastisol nitrocellulose, 1% magnesium oxide burn catalyst, 1% 2-nitrodiphenylamine, 0.32% 2,6-toluene diisocyanate curative, 08% residue*	**14. 03-01-012A: High Performance rocket propellant:** *72% ammonium perchlorate, 22% aluminum, 2.5% dioctyl adipate liquid plasticizer, 2.1% HTPB polymer binder, 1% iron-II-oxide burn catalyst, 0.3% di-issocyante curing agent, 0.09% impurities, 0.01% triphenyl bismuth catalyst*
15. 03-01-013A: High Performance JPL X500 rocket propellant: *68.6% ammonium perchlorate, 23.4% polypropylene glycol 2025 plasticizer, 4.7% toluene diisocyante, 1.9% copper chromite burn rate catalyst, 1.1% 1,2,6-hexanetriol, 0.21% mixed impurities, 0.09% ferric acetyl acetonate*	**16. 03-01-013B: High Performance JPL X500 rocket propellant (with decreased burn rate):** *70% ammonium perchlorate, 23.9% polypropylene glycol 2025 plasticizer, 4.8% toluene diisocyante, 1.2% 1,2,6-hexanetriol, 0.1% ferric acetyl acetonate*
17. 03-01-014A: High Performance rocket propellant with reduced electromagnetic interference exhaust: *69.6% ammonium perchlorate, 14% aluminum, 14% binder, 2% molybdenum, 0.35% iron oxide, 0.05% residue*	**18. 03-01-015A: High Performance impulse rocket propellant:** *50% zirconium hydride, 45% ammonium perchlorate, 5% Viton A copolymer*
19. 03-01-016A: High Performance Teflon based rocket propellant: *69.3% ammonium perchlorate, 18.8% aluminum powder, 8.9% butyl rubber, 2.9% Teflon, 0.10% residue*	**20. 03-01-016B: High Performance Teflon based rocket propellant with reduced burn rate:** *67.3% ammonium perchlorate, 18.2% aluminum powder, 8.6% butyl rubber, 2.8% Teflon, 2.8% triphenlyphosine burn reducer, 0.30% residue*
21. 03-01-016C: High Performance Teflon based "smokeless" rocket propellant with reduced burn rate: *77% ammonium perchlorate, 16% Teflon, 7% butyl rubber*	**22. 03-01-017A: High Performance smokeless polymer rocket propellant:** *81.8% ammonium perchlorate, 10.8% Butadiene copolymer, 2.1% dibutoxyethyoxyethyl formal plasticizer, 2.1% carbon black filler, 1.9% milori blue burning catalyst, 0.38% mixed residues, 0.32% zinc oxide catalyst, 0.32% flexamine antioxidant agent, 0.10% aerosol-OT wetting agent, 0.10% SA-113 vulcanization accelerator, 0.08% sulfur*
23. 03-01-018A: High Performance smokeless polymer rocket propellant: *75.4% ammonium perchlorate, 8.2% ammonium dichromate, 5.6% butadiene copolymer, 5.4% polybutadiene plasticizer, 2.7% milori blue burn catalyst, 2.1% philblack E furnace black, 0.42% magnesium oxide, 0.18% mixed residues*	**24. 03-01-019A: High Performance ammonium perchlorate rocket propellant:** *48.2% ammonium perchlorate, 34.4% magnesium, 17.2% aluminum, 0.20% mixed residues*
25. 03-01-020A: High Performance ammonium perchlorate rocket propellant: *63.4% boron, 31.7% ammonium perchlorate, 2.9% glyceryl monoricinoleate, 1.77% toluene diisocyanate, 0.08% Ferric acetyl acetonate, 0.08% diethanol oleamide, 0.07% balance*	**26. 03-01-021A: High Performance ammonium perchlorate rocket propellant:** *45.47% ammonium perchlorate, 23.1% urea, 11.99% lithium perchlorate, 7.98% epoxy binder, 7.33% polypropylene glycol, 2.49% tallow monoglyceride, 1.35% maleic anhydride, 0.1699% tin octoate curing catalyst, 0.1201% balance (exact decimal places where removed to reduce complications).*
27. 03-01-022A: High Performance meltable-wax ammonium perchlorate rocket propellant: *74.4% ammonium perchlorate, 19% urea, 6.6% wax*	**28. 03-01-023A: High Performance polymeric ammonium perchlorate rocket propellant:** *61.47% ammonium perchlorate, 17.6% epoxy binder, 12.29% urea, 8.19% aluminum, 0.409% tin octoate, and 0.111% balance*
29. 03-01-024A: High Performance ammonium perchlorate	**30. 03-01-025A: High Performance and flexible, ammonium**

rocket propellant: *84% ammonium perchlorate, 14.8% diglycidyl ether, 1% triethylene tetramine, 0.2% balance*	**perchlorate rocket propellant with semicarbazide perchlorate burn increaser:** *54.7% ammonium perchlorate, 29.85% Paralax P-10 binder, 14.9% semicarbazide perchlorate, 0.497% benzoyl peroxide, 0.053% rounded balance*
31. 03-01-026A: High Performance ammonium perchlorate rocket propellant containing magnetic iron oxide burn catalyst: *41.41% ammonium perchlorate, 29.29% nitroglycerine, 17.17% nitrocellulose, 8% triacetin, 2% magnetic iron-III-oxide catalyst, 1% 2-nitrodiphenylamine, 1% resorcinol, 0.13% balance*	**32. 03-01-027A: High Performance rubber-like ammonium perchlorate rocket propellant:** *42.9% polymerized binder, 42% ammonium perchlorate, 15% lithium aluminum hydride, 0.1% carbon black, 0.7% mixed residues*
33. 03-01-027B: High Performance rubber-like ammonium perchlorate rocket propellant: *57.89% ammonium perchlorate, 21% aluminum, 21% partially polymerized binder, 0.11% balance*	**34. 03-01-028A: High Performance ammonium perchlorate rocket propellant utilizing asphalt:** *75% ammonium perchlorate, 10.5% asphalt, 8% castor oil, 3.5% dibutyl sebacate, 3% cetyl acetamide*
35. 03-01-029A: Specialty ammonium perchlorate semi-solid (gelled) rocket propellant: *71.25% ammonium perchlorate, 22.35% unleaded gasoline, 3.75% carbon black, 2.65% aluminum naphthenate*	**36. 03-01-030A: Specialty high performance sterile ammonium perchlorate rocket propellant for use in space rockets:** *64% ammonium perchlorate, 18.8% polyurethane, 16% aluminum, 1.2% ethylene oxide addition agent*
37. 03-01-031A: Classic high performance ammonium perchlorate rocket propellant: *69% ammonium perchlorate, 16% aluminum, 12.98% polymer binder, 1% iron oxide burn catalyst, 0.89% IPDI compound, 0.13% AO-2246 curing catalyst*	**38. 03-01-032A: High performance ammonium perchlorate rocket propellant:** *65% ammonium perchlorate, 16.8% polypropylene glycol, 15% aluminum powder, 2.14% toluene diisocyante polymerization process, 0.5% alosperse, 0.27% trimethylol propane, 0.25% phenyl beta-naphthylamine, 0.04% possible moisture*
39. 03-01-033A: High performance ammonium perchlorate rocket propellant: *79.59% ammonium perchlorate, 10.1% dibutyl sebacate, 10.1% polyvinyl chloride, 0.2% dibutyl tin dilaurate, 0.01% possible moisture*	**40. 03-01-034A: High performance smokeless ammonium perchlorate rocket propellant:** *67.9% ammonium perchlorate, 26.3% polybutadiene polymer, 2% aluminum, 1.5% diglycidyl ether, 1% butadiene polymer, 1% dioctyl adipate, 0.036% chromium compound catalyst, 0.264% balanced*
41. 03-01-034B: High performance smokeless ammonium perchlorate rocket propellant (modified): *67.9% ammonium perchlorate, 26.3% polybutadiene polymer, 2.1% polymer butadiene, 2% aluminum, 1.47% diglycidyl ether, 0.06% chromium compound catalyst, 0.17% balanced*	**42. 03-01-034C: High performance smokeless ammonium perchlorate rocket propellant (modified):** *67.9% ammonium perchlorate, 26.3% polybutadiene polymer, 2.1% polymer butadiene, 2% aluminum, 1.47% epoxy compound, 0.06% chromium compound catalyst, 0.17% balanced*
43. 03-01-035A: High performance smokeless ammonium perchlorate rocket propellant with copper sulfide burn accelerator: *83.3% ammonium perchlorate, 14.44% polybutadiene resin, 2.22% copper-II-sulfide, 0.04% residual balance*	**44. 03-01-035B: High performance ammonium nitrate rocket propellant with copper sulfide burn accelerator:** *83.3% ammonium nitrate, 14.44% polybutadiene resin, 2.22% copper-II-sulfide, 0.04% residual balance*
45. 03-01-036A: High performance ammonium perchlorate rocket propellant with copper sulfide burn accelerator (aluminum based): *76.33% ammonium perchlorate, 13.23% aluminum powder, 7.63% epoxy resin, 2.79% copper-II-sulfide, 0.02% impurities*	**46. 03-01-037A: High performance ammonium perchlorate rocket propellant (with metal hydride accelerator component):** *43.01% ammonium perchlorate, 26.88% ammonium nitrate, 12.54% sodium hydride, 8.96% epoxy resin, 4.2% magnesium powder, 2.5% titanium hydride, 1.79% copper-II-chromite burn rate catalyst, 0.12% residual impurities*
47. 03-01-038A: High performance ammonium perchlorate rocket propellant (with silicon monoxide accelerator component): *84.53% ammonium perchlorate, 12.25% butadiene-1,3 binder, 2.42% methacrylic acid catalyst, 0.64% magnesium oxide filler, 0.146% silicon monoxide burn rate accelerator, 0.014% residual balance*	**48. 03-01-038B: High performance ammonium perchlorate rocket propellant (with silicon monoxide and silicon nitride accelerator component):** *76.39% ammonium perchlorate, 11.07% butadiene-1,3, 3.97% sulfur, 2.98% potassium dichromate, 2.25% silicon nitride, 2.18% stearic acid, 0.79% silicon monoxide, 0.26% magnesium oxide filler, 0.11% residual balance*
49. 03-01-039A: High performance castable ammonium perchlorate rocket propellant: *83.65% ammonium perchlorate, 12.92% PVC, 3.42% dioctyl sebacate, 0.01% mixed impurities*	**50. 03-01-039B: High performance castable ammonium perchlorate rocket propellant (with silicon nitride and calcium carbide burn enhancer):** *78.56% ammonium perchlorate, 11.94% ammonium perchlorate, 3.52% dioctyl sebacate, 3.14% silicon nitride, 2.83% calcium carbide, 0.01% impurities*

51. 03-01-040A: High Performance ammonium perchlorate rocket propellant with nitrocellulose base: *47.79% ammonium perchlorate, 25.97% nitrocellulose, 20.77% triacetin, 5.19% tri-butoxyethyl phosphate, 0.25% lecithin, 0.03% balance*	**52. 03-01-040B: High Performance ammonium perchlorate rocket propellant with nitrocellulose base:** *48.32% ammonium perchlorate, 21.59% nitrocellulose, 15.42% triacetin, 10.28% methyl phthalyl ethyl glycolate, 3.85% nitroglycerine, 0.25% lecithin, 0.25% diphenyl amine, 0.04% residual balance*
53. 03-01-040C: High Performance ammonium perchlorate rocket propellant with nitrocellulose base: *63.15% ammonium perchlorate, 18.04% nitrocellulose, 10.82% diethyl phthalate, 7.21% triacetin, 0.75% lecithin, 0.03% residual balance*	**54. 03-01-040D: High Performance ammonium perchlorate rocket propellant with nitrocellulose base:** *49.38% ammonium perchlorate, 24.69% nitrocellulose, 12.34% diethyl phthalate, 12.34% bis-(3,5,5-trimethoxyhexyl) adipitate, 1.23% lecithin, 0.02% residual impurities*
55. 03-01-041A: Specialty high Performance ammonium perchlorate rocket propellant: *67.9% ammonium perchlorate, 15.99% aluminum powder, 15.72% hydroxy terminated liquid resin binder, 0.2999% polymerized tartaric acid compound, 0.0901% residue*	**56. 03-01-042A: High Performance ammonium perchlorate rocket propellant:** *49.6% ammonium perchlorate, 49.2% polychlorotrifluoroethylene copolymer, 1.2% paraffin wax binder*
57. 03-01-043A: High performance low temperature burning smokeless propellant: *85% ammonium perchlorate, 9.33% n-butyl acrylate binder, 3.58% polyester binder compound, 1.44% methyl acrylate binder, 0.4% methyl amyl ketone peroxide cure catalyst, 0.25% lecithin wetting agent.*	**58. 03-01-043B: High performance moderate temperature burning smokeless propellant:** *75% ammonium perchlorate, 12.35% polyester binder, 12.35% styrene, 0.25% cumene hydroperoxide cure catalyst, 0.05% lecithin wetting agent*
59. 03-01-044A: High performance smokeless propellant: *75% ammonium perchlorate, 12.25% PVC, 12.25% dibutyl sebacate, 0.49% barium ricinoleate stabilizer, 0.01% mixed balance*	**60. 03-01-045A: High performance smokeless propellant:** *65% ammonium perchlorate, 16.8% polypropylen glycol plasticizer, 15% aluminum powder, 2.14% toluene diisocyante polymerization catalyst, 0.5% "alosperse" polymerization agent, 0.27% trimethylol propane binder aid, 0.25% phenyl beta-naphthylamine binder catalyst, 0.04% ferric acetyl acetonate catalyst*
61. 03-01-046A: Specialty high Performance polymer-based rocket propellant: *64% ammonium perchlorate, 18.8% polyurethane, 16% aluminum powder, 1.2% ethylene oxide polymerization agent*	

03-01-001A: High Performance Military grade rocket propellant:
Add and dissolve ***93 grams of a plastic elastomer*** (commercially available and sold under the trade name Kraton 1107) into 150 milliliters of toluene. The polymer will readily dissolve in a few minutes at room temperature to form a solution. Next, add in ***1.8 grams of a standard aziridine BA114 compound resin*** (commercially available), followed by ***96 grams of aluminum powder***. After the additions, vigorously stir the toluene mixture for about 15 minutes. Thereafter, add in ***408 grams of finely divided ammonium perchlorate*** while maintaining strong stirring of the toluene mixture. After adding in the ammonium perchlorate, stir the mixture for 2 hours at room temperature. Afterwards, pour the entire toluene mixture into a shallow pan with a high surface area and allow the toluene to evaporate (may take up to 3 days). After the odor of toluene is gone, remove the dry solid propellant and then chop it into tiny pieces. Now, to use the propellant, place the your chopped-up pieces of dry solid propellant into a beaker or suitable chemical resistant container, and then gently heat to 150 Celsius until the propellant becomes a viscous liquid. When the propellant has become a viscous liquid, you may then pour this liquid into your rocket motor or rocket mold, which you should already have designed and built (make sure your rocket motor or rocket motor mold can withstand a temperature of 150 Celsius). Once your rocket motor or mold has been poured, gently but firmly shake (for several minutes) your rocket motor or rocket mold to remove any air bubbles that might be trapped. Note: removing air bubbles is essential to prevent possible rocket failure (explosions). Thereafter, cure your rocket motor or mold for several days in a dark place at room temperature. After several days, your rocket motor is ready for test firing, or deployment. If you used a mold, your solid rocket propellant can then be removed from the mold or container in one piece. Note: Do not use a blasting cap or detonator for initiation.
Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***68.13% ammonium perchlorate, 16.03% aluminum, 15.53% kraton polymer binder, 0.30% aziridine resin, 0.01% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Standard military rocket fuel for rockets, missiles, and the like. Has excellent thrust capability, and is used for propelling high explosive warheads.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with.

03-01-002A: High Performance Military grade rocket propellant:
Add ***68 grams of RB-810 resin*** (commercially available), followed by ***128 grams of dioctyl adipate*** (commercially available), and then followed by ***6.4 grams of lecithin*** to any suitable beaker or heat resistant container, and then heat the contents in the beaker or container to 71 Celsius. Thereafter, rapidly blend the ingredients in the beaker or container for 15 to 30 minutes at 71 Celsius. Afterwards, slowly and carefully add in ***600 grams of finely divided ammonium perchlorate***. During the addition of the ammonium perchlorate continue heating and blending. After adding in the ammonium perchlorate, continue heating and stirring the mixture for about 30 minutes. Afterwards, pour the propellant mixture into your rocket motor or rocket mold, which you should already have designed and built (make sure your rocket motor or rocket motor mold can withstand a temperature of 71 Celsius). Once your rocket motor or mold has been poured, gently but firmly shake (for several minutes) your rocket motor or rocket mold to remove any air bubbles that might be trapped. Note: removing air bubbles is essential to prevent possible rocket failure (explosions). Thereafter, cure your rocket motor or mold for several days in a dark place at room temperature. After several days, your rocket motor is ready for test firing, or deployment. If you used a mold, your solid rocket propellant can then be removed from the mold or container in one piece. Note: Do not use a blasting cap or detonator for initiation.
Burn rate: Fast
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***74.77%% ammonium perchlorate, 15.95% dioctyl adipate binder, 8.47% RB-100 resin, 0.79% lecithin catalyst, 0.02% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Standard military rocket fuel for rockets, missiles, and the like. Has excellent thrust capability, and is used for propelling high explosive warheads.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with.

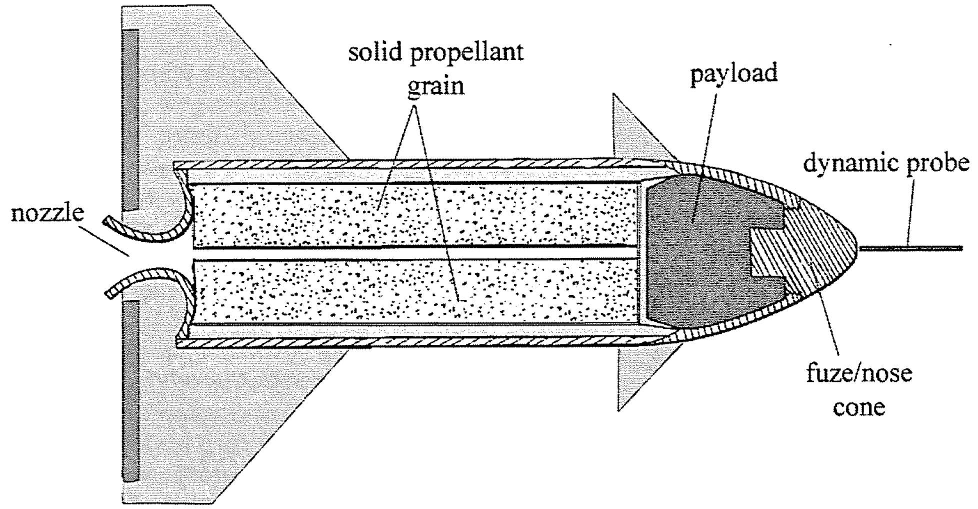
03-01-003A: High Performance Military grade rocket propellant with PVC:
Into a suitable beaker or container, add 600 milliliters of tetrahydrofuran solvent. Thereafter, add in ***80 grams of PVC*** and then stir the mixture to dissolve the PVC. Note: PVC pipes from the hardware store can be used. Once the PVC has dissolved, filter the solution, to remove any insoluble materials, and then pass the filtered solvent mixture (three times) through a layer of aluminum oxide contained in a silica gel column. Thereafter, add to your filtered solvent mixture containing the dissolved PVC, ***4 grams of Epon 815 epoxy agent***, followed by ***4 grams of magnesium sulfide***, and then followed by ***320 grams of finely divided ammonium perchlorate***. Thereafter, rapidly stir the entire mixture for about 15 to 30 minutes at a temperature around 40 Celsius. Afterwards, remove the heat source, and then quickly add in, before the mixture cools, 600 milliliters of warm water. Thereafter, allow the entire mixture to cool to room temperature, and rapidly stir it during this cool down period. Once the mixture has cooled, continue to rapidly stir the mixture at room temperature for about 30 minutes. After 30 minutes, filter the mixture to collect the insoluble propellant mixture. You can use gravity filtration or vacuum filtration. Gravity filtration takes the longest amount time, so vacuum filtration is recommended. If using, vacuum filtration, suck the propellant mixture dry. If you used gravity filtration, once your propellant mixture has been removed, recover the pasty material from the filter paper, and place it onto a shallow pan and spread it out, and allow it to air-dry for several days or until completely dry. Either way, once your propellant is completely dry, you can move onto the packing process. Now, place your propellant into a suitable beaker or container, and then add in 50 milliliters of 99% isopropyl alcohol or 95% ethyl alcohol, and then vigorously stir the entire mixture to form a paste of similar mixture. Thereafter, press this mixture into your rocket motor or rocket mold, which you should already have designed and built. Once your rocket motor or mold has been filled, gently but firmly shake (for several minutes) your rocket motor or rocket mold to remove any air bubbles that might be trapped. Note: removing air bubbles is essential to prevent possible rocket failure (explosions). Finally, place your rocket motor or mold into a warm dry place and allow it to cure for up to 7 days.
Burn rate: Fast
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***78.43% ammonium perchlorate, 19.6% PVC polymer, 0.98% Epon 815 epoxy resin, 0.98% magnesium sulfide catalyst, 0.01% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Standard military rocket fuel for rockets, missiles, and the like. Has excellent thrust capability, and is used for propelling high explosive warheads.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with.

03-01-004A: High Performance military rocket propellant (JPL X500 type):
Into a standard ball mill, place ***196 grams of ammonium perchlorate*** of 100 mesh, followed by ***84 grams of ammonium perchlorate*** of 30 microns, followed by ***40 grams of dioctyl azelate***, followed by ***4 grams of copper chromite***, followed by ***200 milligrams of ferric acetylacetonate***, and then 100 grams of Teflon coated steel shot of 4 to 5 millimeters in diameter. Thereafter, thoroughly tumble the mixture for 1 hour at room temperature. At the same time, into a standard blender, equipped with plastic stirring blades rather then sharp steel ones, place ***5.4 grams of poly propylene glycol***, followed by ***24 grams of hexane triol***. Thereafter, thoroughly blend this mixture for 1 hour at room temperature on high speed. After preparing these two mixtures, place both of them into a specially deigned heated blender with vacuum pump and gauge. Thereafter, thoroughly blend the two mixtures on high speed at 30 Celsius under a vacuum of 10 millimeters of mercury for about 35 minutes. Immediately after 35 minutes, equalize the reduced pressure, open the machine, and toss in ***6 grams of 2,4-toluene diisocyante***, and then continue to heat and blend the mixture on high speed and under a vacuum of about 20 millimeters of mercury at 23 to 25 Celsius for about 10 minutes. Afterwards, the propellant mixture is ready to cast. To do so, simply pour and press the propellant into any desired rocket motor or mold, and then vibrate the motor or mold vigorously to remove any air-bubbles or the like. Finally, let your motor or mold cure for about 1 to 2 weeks at room temperature.
Burn rate: 0.1 to 0.2 inches per second at nominal pressure.
Water resistance: Good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***77.8% ammonium perchlorate, 11% dioctyl azelate, 6.6% hexane triol plasticizer, 1.6% 2,4-toluene diisocyanate, 1.5% poly propylene glycol plasticizer, 1.1% copper chromite burn rate accelerator, 0.05% ferric acetylacetonate curing catalyst, 0.35% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Standard military rocket fuel for rockets and missiles.

03-01-005A: High Performance military rocket propellant:
Into a standard heated blender, with plastic stir blade rather then sharp steel, place ***21 grams of poly-1,2-butylene glycol***, followed by ***4.8 grams of a polyoxypropylene derivative of trimethylolpropane***. Thereafter, blend on high for about 30 minutes at 45 Celsius. After 30 minutes, continue heating and stirring the mixture, and add in ***400 milligrams of flours of sulfur***, and then followed by ***72 grams of powdered aluminum***. Thereafter, continue to thoroughly mix the mixture on high at 45 Celsius for about 2 hours. After 2 hours, add in ***272 grams of ammonium perchlorate***, followed immediately by ***16 grams of hexamethylene diisocyanate***, and then followed by 15 milliliters of cold water. Then continue to rapidly blend the mixture on high at 45 Celsius for a bout 1 hour until a fluidized mixture is obtained. After about 1 hour, the propellant is ready to be poured and pressed. To do so, pour the fluidized propellant into your rocket motor or mold, and then apply several hundred psi worth of pressure to press the propellant, and after pressing, vigorously vibrate the rocket motor or mold to shake out any dissolved gases such as air-bubbles. Finally, let your motor or mold cure for about 1 to 2 weeks at room temperature.
Burn rate: Very Fast
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***70% ammonium perchlorate, 18.6% aluminum, 5.4% ploy-1,2-butylene glycol plasticizer, 4% hexamethylene diisocyante curative, 1.2% polyoxypropylene derivative of trimethylolpropane curative, 0.10% sulfur, 0.70% moisture***
Classification: Deflagrating explosive (classified as propellant).
Use: Standard military rocket fuel for rockets, missiles, and the like.

Classic rocket design	Details
	Rocket design is virtually the same in any field and exists of a solid core of rocket grain, a nozzle, and fins for stabilization. The rocket grain can be fired using any ignition means in the usual manner. The adjacent rocket design portraits the rocket grain, and omits the fuze and payload, which will be included in later illustrations.

03-01-006A: High Performance military rocket propellant (with negative pressure exponent):
Into a standard heated blender, equipped with plastic blade, place ***232 grams of finely divided ammonium perchlorate***, followed by ***72 grams of ammonium sulfate***, followed by ***56 grams of poly propylene glycol***, followed by ***5 grams of poly propylene glycol adduct of trimethylol propane***, followed by ***3 grams of triethylamine***, followed by ***200 milligrams of ferric acetylacetonate***, followed by ***6.3 grams of 2,4-toluene diisocyanate***, and then finally followed by ***24 grams of dioctyl adipate***. Thereafter, thoroughly blend this mixture for 2 hours at 45 Celsius under high speed. After blending the mixture for 2 hours, its ready to use. To use, simply pour and press the propellant into any desired rocket motor or mold, and then vibrate the motor or mold vigorously to remove any air-bubbles or the like. Finally, let your motor or mold cure for about 1 to 2 weeks at room temperature.

Burn rate: 0.1 to 0.124 inches per second at 400 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***58.2% ammonium perchlorate, 18% ammonium sulfate, 14% poly propylene glycol plasticizer, 6% dioctyl adipate, 1.5% 2,4-toluene diisocyanate, 1.2% poly propylene glycol adduct of trimethylol propane, 0.75% triethylamine catalsyst, 0.05% ferric acetylacetonate curing catalyst, 0.30% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Specialty military rocket fuel for missiles.

03-01-007A: High Performance military rocket propellant (reduced flash):
Into a suitable blender equipped with plastic stirring blade, place ***344 grams of polyethylene glycol***, followed by ***416 grams of nitroguanidine***, and then thoroughly blend this mixture for 15 to 30 minutes at room temperature on high. Thereafter, add in ***200 grams of aluminum powder***, and then thoroughly blend for 15 to 30 minutes at room temperature on high. Finally, add in ***510 grams of ammonium perchlorate***, and ***100 grams of ammonium nitrate***, and then thoroughly blend the mixture for 2 hours at room temperature on high. After the blending, the propellant mixture needs to be pressed into your rocket motor or mold under high pressure, and thereafter the rocket motor should be cured for several days at 30 Celsius.
Burn rate: 0.23 to 0.26 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***32% ammonium perchlorate, 26.4% nitroguanidine, 21.9% polyethylene glycol binder, 12.7% aluminum, 6.3% ammonium nitrate, 0.70% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Specialty military rocket fuel for missiles.

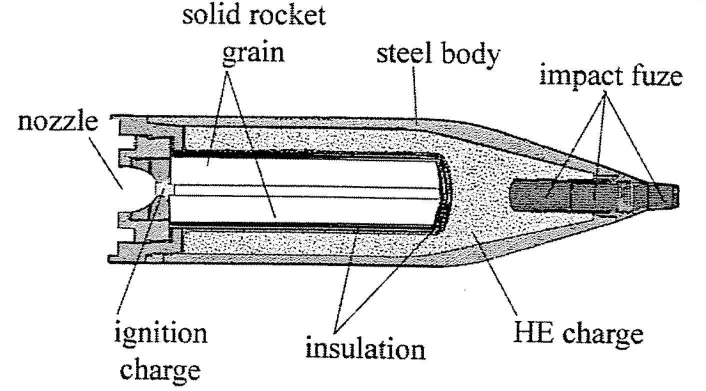
03-01-008A: High Performance polymeric military rocket propellant:
Into a suitable mixing bowl, or any suitable mixing container, equipped with motorized stirrer, place ***20.8 grams of epoxy resin D.E.R. 332***, followed by ***59.2 grams of polybutylene glycol diamine***, followed by ***80 grams of finely ground aluminum powder*** sold as Alcoa-123, and then heat the mixture to about 60 Celsius with moderate stirring for about 20 minutes. After 20 minutes, add in ***340 grams of ammonium perchlorate*** of standard mesh, and then continue to blend the mixture at 60 Celsius for another 20 minutes or so. Thereafter, the liquid mixture is ready to be cast. To do so, it needs to be poured and vibrated into any desirable rocket motor or mold, and then cured in an oven at 60 Celsius for about 2 hours, followed by curing in the same oven at 80 Celsius for about 17 hours. After 17 hours, the rocket motor will be entirely cured, and should then be removed for the oven and cooled. The solid propellant grain will have a rubbery like consistency.
Burn rate: 0.35 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***68% ammonium perchlorate, 16% aluminum, 11.8% polybutylene glycol diamine, 4.1% epoxy resin D.E.R. 332, 0.10%, residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used as a solid fuel for military rockets, missiles, and in rockets for space exploration.

03-01-009A: High Performance "plateau-burning" polymeric rocket propellant:
Into a suitable mixing bowl, mixer, blender, or similar container, place ***102 grams of polybutyl acrylic acid terpolymer binder***, followed by ***18 grams of Epon 828 epoxy resin***, followed by ***5 grams of lithium powder***, and then followed by ***375 grams of finely divided ammonium perchlorate*** of average mesh, and then blend the mixture using a motorized stirrer equipped with plastic stir blade on moderate speed for about 15 to 20 minutes. Thereafter, pour, press, and vibrate the mixture into any desirable rocket motor, engine, mold, ect., and then cure the munition in an oven at 55 Celsius for about 3 days.
Burn rate: 0.40 to 0.46 inches per second at 500 psi

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***75% ammonium perchlorate, 20.4% polybutyl acrylic acid binder, 3.6% epon 828 epoxy resin, 1% lithium fluoride stabilizer***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets for military and commercial use.

03-01-010A: High Performance polymeric rocket propellant:

Into a suitable mixing bowl, mixer, blender, or similar container, equipped with heating source, place ***32.8 grams of diglycidyl ether of bisphenol A*** (having an epoxide equivalent weight from 475 to 575, commercially available), followed by ***65 grams of diglycidyl ether of polypropylene glycol*** (having an epoxide equivalent weight of 330 and a viscosity of 42 cps., commercially available), followed by ***88.5 grams of aluminum powder of 325 mesh***, followed by ***95 grams of ammonium perchloratee of 250 mesh***, followed by ***224 grams of standard ammonium perchlorate*** of average mesh, and then blend the mixture at 30 Celsius using a motorized stirrer equipped with plastic stir bladed on moderate speed for about 10 to 15 minutes. Immediately thereafter, add in ***6 grams of monoethanolamine***, followed by ***1.1 grams of diethylentriamine***, and then continue to blend the mixture at 30 Celsius on moderate speed for about 15 minutes. After 15 minutes, pour, press, and vibrate the mixture into any desirable rocket motor, engine, mold, ect., and then cure the munition in an oven at 108 Celsius for about 2 hours.
Burn rate: 0.3 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***62.2% ammonium perchlorate, 17.2% aluminum, 12.6% diglycidyl ether polypropylene glycol binder, 6.4% diglycidyl ether bisphenol A binder, 1.1% monoethanolamine catalyst, 0.21% diethylentriamine curing catalyst, 0.29% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets for military and commercial use.

Rocket assisted artillery shell	Details:
 solid rocket grain steel body impact fuze nozzle ignition charge insulation HE charge	The adjacent illustration outlines the design of a simple rocket assisted projectile, more commonly seen in 155 and 280 millimeters shells. The rocket assistance can increase the overall range of the shell by about 5 to 8 kilometers; however, the payload weight, being an explosive charge in most cases, is decreased as would be expected due to weight limitations.

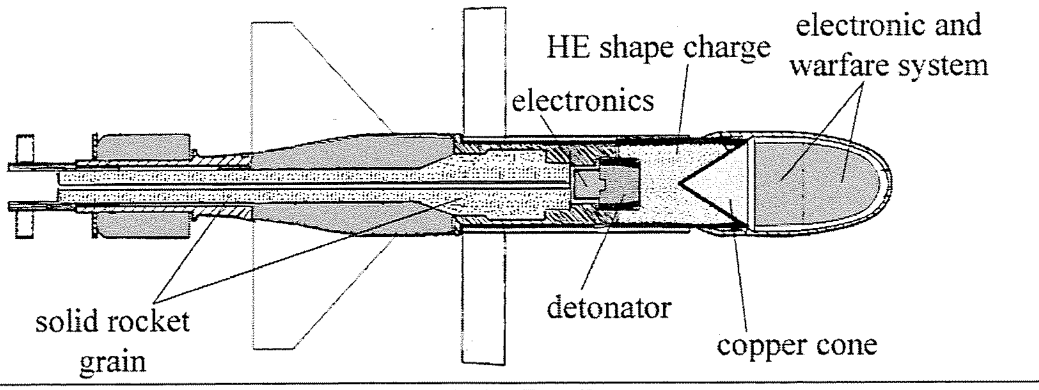
03-01-010A: High Performance polymeric rocket propellant (modified with increased burn rate—aluminum free):

Into a suitable mixing bowl, mixer, blender, or similar container, equipped with heating source, place ***32.8 grams of diglycidyl ether of bisphenol A*** (having an epoxide equivalent weight from 475 to 575, commercially available), followed by ***65 grams of diglycidyl ether of polypropylene glycol*** (having an epoxide equivalent weight of 330 and a viscosity of 42 cps., commercially available), followed by ***95 grams of ammonium perchlorate of 250 mesh***, followed by ***224 grams of standard ammonium perchlorate*** of average mesh, and then blend the mixture at 30 Celsius using a motorized stirrer equipped with plastic stir bladed on moderate speed for about 10 to 15 minutes. Immediately thereafter, add in ***6 grams of monoethanolamine***, followed by ***1.1 grams of diethylentriamine***, and then continue to blend the mixture at 30 Celsius on moderate speed for about 15 minutes. After 15 minutes, pour, press, and vibrate the mixture into any desirable rocket motor, engine, mold, ect., and then cure the munition in an oven at 108 Celsius for about 2 hours.
Burn rate: 0.6 inches per second at 1000 psi
Water resistance: Good.

Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***75.2% ammonium perchlorate, 15.3% diglycidyl ether polypropylene glycol binder, 7.7% diglycidyl ether bisphenol A binder, 1.4% monoethanolamine catalyst, 0.25% diethylentriamine curing catalyst, 0.15% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets for military and commercial use.

03-01-011A: High Performance polyurethane rocket propellant:

Into a suitable mixing bowl, mixer, blender, or similar container, equipped with heating source, place ***75 grams of aluminum powder of standard mesh***, followed by ***19.5 grams of dioctylsebacate plasticizer***, followed by ***35.8 grams of polybutadiene diol*** (of 6000 molecular weight, available from Phillips Petroleum Company), followed by ***1.5 grams of polypropylene oxide triol*** (of 700 molecular weight), followed by ***250 milligrams of dihydroxypropyl bis(cyanoethylamine)***, followed by ***2 grams of 2,6-toluene diisocyante***, and then followed by ***100 milligrams of ferric acetylacetonate***, and then blend the mixture on moderate speed for about 10 minutes. Thereafter, add in ***365 grams of standard ammonium perchlorate*** of average mesh, and then continue to blend the mixture on moderate speed for about 15 to 20 minutes to form a uniform mix. Thereafter, add in ***750 milligrams of finely divided nickel-II-hydroxide***, and then continue to blend the mixture on moderate speed for about 5 minutes. Finally, the mixture is ready to cure. To do so, it should be pressed and vibrated into any desirable rocket motor, engine, mold, ect., and then cured in an oven at 57 Celsius for 10 days. The excessive amount of curing time is to allow proper polymerization. Requires proper ignition composition.
Burn rate: 0.3 to 0.4 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***73% ammonium perchlorate, 15% aluminum, 7.1% polybutadiene diol binder, 3.9% dioctylsebacate plasticizing agent, 0.4% 2,6,-toluene diisocyanate, 0.3% polyprpylene oxide triol binding agent, 0.15% nickel-II-hydroxide curing agent, 0.08% residue, 0.05% dihydroxypropyl bis(cyanoethylamine curing catalyst, 0.02% ferric acetylacetonate,***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets for military and commercial use.

Laser guided missile system
 HE shape charge electronic and warfare system electronics solid rocket grain detonator copper cone
Description/Details
The above illustration shows a laser guided or wire guided rocket assisted anti-tank projectile.

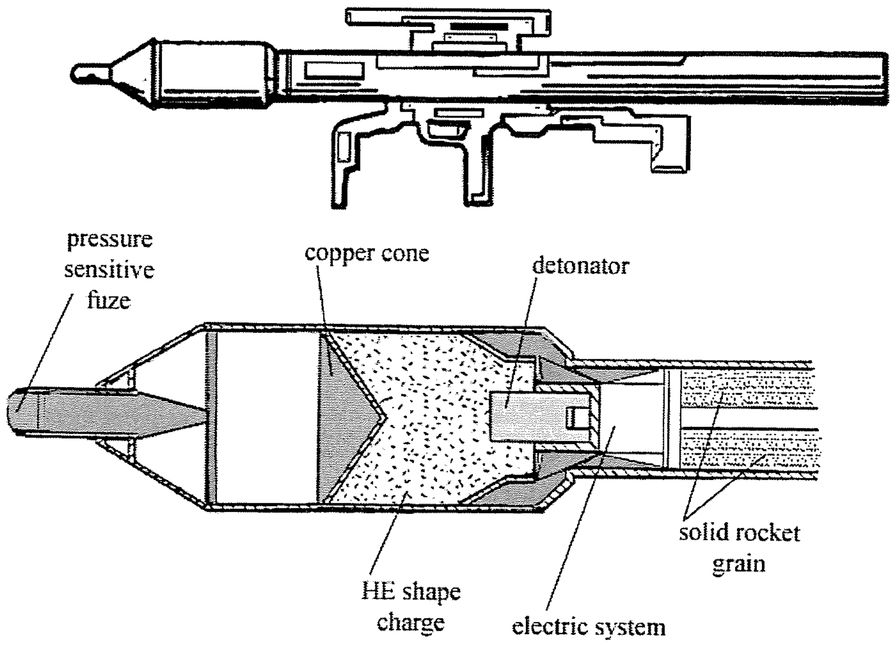
03-01-012A: High Performance CMDB rocket propellants (composite modified Double Base propellants):

Into a suitable mixing bowl, mixer, blender, or similar container, place ***23 grams of triacetin***, followed by ***70 grams of finely divided aluminum powder***, followed by ***5 grams of finely divided magnesium oxide***, followed by ***5 grams of 2-nitrodiphenylamine***, followed by ***20 grams of plastisol nitrocellulose***, followed by ***245 grams of ammonium perchlorate***, and then blend the mixture on low speed at room temperature for about 10 minutes. After 10 minutes, slowly add in ***130 grams of nitroglycerine***, followed by ***1.6 grams of 2,6-toluene diisocyanate***, and then continue to blend the mixture on low speed 10 to 15 minutes to form a uniform mixture. Thereafter, the mixture is ready to be used. To use, the propellant needs to be pressed into any desirable rocket motor, engine, ect., under mild pressure, and then allowed to cure at room temperature for about several days. Note: heat may or may not be used to speed up the curing process, and caution should be taken. Requires proper ignition composition.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: *49% ammonium perchlorate, 26% nitroglycerine, 14% aluminum, 4.6% triacetin, 4% plastisol nitrocellulose, 1% magnesium oxide burn catalyst, 1% 2-nitrodiphenylamine, 0.32% 2,6-toluene diisocyanate curative, 08% residue*
Classification: Deflagrating explosive (classified as propellant).
Use: Widely used in high performance rockets for military and commercial use. Also used as a high performance gun propellant, and can be granulated using various techniques listed in the gun propellants section.

03-01-012A: High Performance rocket propellant:
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing plastic sir blades, place 200 milliliters of acetone, followed by ***110 grams of standard powdered aluminum***, followed by ***5 grams of finely dived red iron-III-oxide***, followed by ***10.5 grams of HTPB polymer binder*** (hydroxy terminated polybutadiene), followed by ***12.5 grams of dioctyl adipate liquid plasticizer***, followed by ***50 milligrams of triphenyl bismuth***, and then blend the mixture until nearly all the acetone has evaporated. Thereafter, add in ***360 grams of ammonium perchlorate***, followed by ***1.5 grams of di-isocyanate curing agent***, and then continue to blend the mixture on moderate speed for about 10 to 15 minutes. After the 10 to 15 minute blending period, the mixture is ready to be casted and cured. To do so, pour, press, and vibrate the mixture into any suitable rocket motor, engine, ect., and the cure the munition in an oven at 40 to 50 Celsius for several hours or more. Use a standard ignition composition for proper burn.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: *72% ammonium perchlorate, 22% aluminum, 2.5% dioctyl adipate liquid plasticizer, 2.1% HTPB polymer binder, 1% iron-II-oxide burn catalyst, 0.3% di-issocyante curing agent, 0.09% impurities, 0.01% triphenyl bismuth catalyst*
Classification: Deflagrating explosive (classified as propellant).
Use: Widely used standard high performance rocket propellant with multiple uses.

Rocket Propelled Grenade (RPG)



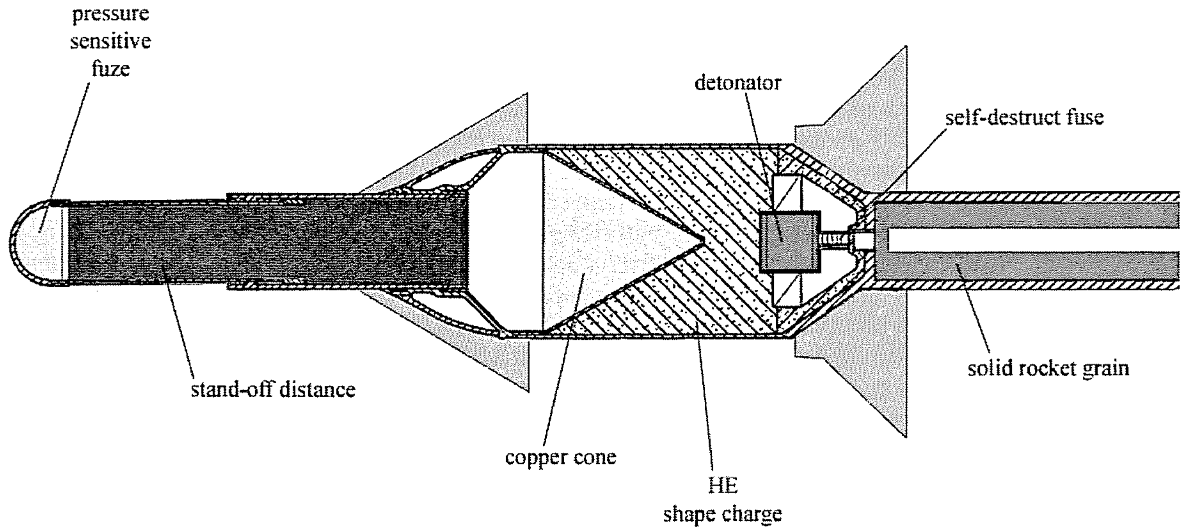
Details:
This illustration demonstrates an anti-tank warhead fired from a re-loadable rocket system called an RPG. Upon firing, the rockets grain ignites propelling the warhead towards the target. Upon impact, a special electric fuze, generates an electric current upon impact. This current initiates the explosive train, which detonates the shape charge. The shape charge produces a blast of

tremendous force, which blasts a hole through any know substance, especially metal with ease.

03-01-013A: High Performance JPL X500 rocket propellant:
Into a suitable horizontal ball mill, filled with Teflon coated steel shot of the usual diameter and size, place ***105 grams of ground ammonium perchlorate***, followed by ***245 grams of ungrounded ammonium perchlorate***, followed by ***10 grams of copper chromite***, followed by ***500 milligrams of ferric acetyl acetonate***, and then tumble the mixture for about 30 minutes at 150 RPM to form a uniform mixture. Afterwards, into a suitable mixing container, equipped with vacuum gauge, motorized stirrer, and heating source, place the dry tumbled mixture previously prepared, followed by ***119.5 grams of polypropylene glycol 2025***, followed by ***6 grams of 1,2,6-hexanetriol***, and then blend the mixture on moderate speed for about 30 minutes under a vacuum of 10 millimeters of mercury at a temperature of 23 Celsius. Thereafter, quickly remove the vacuum, open the mixing container, and then throw in ***24 grams of toluene diisocyante***, and then reseal the container, apply a vacuum of 10 millimeters of mercury, and then continue to blend the mixture on moderate speed for about 10 minutes at 23 Celsius. Thereafter, the propellant mixture is ready to be casted. To do so, simply pour it into any desirable rocket motor, engine, mold, ect., and then briefly vibrate the munitions to remove air bubbles, and then cure the munition(s) in an oven at 60 celsius for about 16 hours. Requires standard rocket propellant ignition compositions.
Burn rate: 0.30 to 0.40 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: *68.6% ammonium perchlorate, 23.4% polypropylene glycol 2025 plasticizer, 4.7% toluene diisocyante, 1.9% copper chromite burn rate catalyst, 1.1% 1,2,6-hexanetriol, 0.21% mixed impurities, 0.09% ferric acetyl acetonate*
Classification: Deflagrating explosive (classified as propellant).
Use: Widely used high performance rocket propellant with multiple uses.

03-01-013B: High Performance JPL X500 rocket propellant (with decreased burn rate):
This procedure is identical to 03-01-013A, with the exception that the burn rate catalyst has been removed. Into a suitable horizontal ball mill, filled with Teflon coated steel shot of the usual diameter and size, place ***105 grams of ground ammonium perchlorate***, followed by ***245 grams of ungrounded ammonium perchlorate***, followed by ***500 milligrams of ferric acetyl acetonate***, and then tumble the mixture for about 30 minutes at 150 RPM to form a uniform mixture. Afterwards, into a suitable mixing container, equipped with vacuum gauge, motorized stirrer, and heating source, place the dry tumbled mixture previously prepared, followed by ***119.5 grams of polypropylene glycol 2025***, followed by ***6 grams of 1,2,6-hexanetriol***, and then blend the mixture on moderate speed for about 30 minutes under a vacuum of 10 millimeters of mercury at a temperature of 23 Celsius. Thereafter, quickly remove the vacuum, open the mixing container, and then throw in ***24 grams of toluene diisocyante***, and then re-seal the container, apply a vacuum of 10 millimeters of mercury, and then continue to blend the mixture on moderate speed for about 10 minutes at 23 Celsius. Thereafter, the propellant mixture is ready to be casted. To do so, simply pour it into any desirable rocket motor, engine, mold, ect., and then briefly vibrate the munitions to remove air bubbles, and then cure the munition(s) in an oven at 60 celsius for about 16 hours. Requires standard rocket propellant ignition compositions.
Burn rate: 0.30 to 0.40 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: *70% ammonium perchlorate, 23.9% polypropylene glycol 2025 plasticizer, 4.8% toluene diisocyante, 1.2% 1,2,6-hexanetriol, 0.1% ferric acetyl acetonate*
Classification: Deflagrating explosive (classified as propellant).
Use: Widely used high performance rocket propellant with multiple uses.

Anti-tank projectile



Details:

Another classic design of an anti-tank shape charge. A copper cone is placed inversed to the inverted cone shape of high explosive. Upon detonating of the shape charge, its energy is condensed into a fine stream composed of super heated gas and particles. This "jet" moves at incredible speed, topping nearly 29,000 miles per hour, and is capable of penetrating almost any substance.

03-01-014A: High Performance rocket propellant with reduced electromagnetic interference exhaust:
Into a suitable mixing drum, bowl, blender, ect., equipped with motorized stirrer, place ***70 grams of finely powdered aluminum***, followed by ***1.75 grams of red iron-III-oxide***, followed by ***10 grams of finely divided molybdenum*** of 6 microns, followed by ***348 grams of ammonium perchlorate*** of average mesh, and then followed by ***70 grams of a binder*** represented as a carboxy terminated polybutadiene compound containing a polyfunctional aziridinyl compound and a trifunctional epoxy resin with cross linking agents and dioctyl adipate plasticizer sold as Grade 390-325 by the Sylvania Electronic Products, inc., and then blend the mixture at room temperature on high speed for about 10 to 15 minutes to form a uniform mixture. Thereafter, cast the fluidized mixture into any desirable rocket motor, engine, ect, using the usual techniques, and then cure the munitions in an oven at 71 Celsius for several hours, or at room temperature for several days.
Burn rate: 0.2 to 0.30 inches per second at 1000 psi
Radar retention: 0.5 at 90 degrees
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***69.6% ammonium perchlorate, 14% aluminum, 14% binder, 2% molybdenum, 0.35% iron oxide, 0.05% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets and missiles, which utilize sensitive radar or radio guided guidance systems, or sensitive electronic equipment where electromagnetic interferences may decrease said guidance/electrical systems effectiveness, such as in space craft or specialty military weapons.

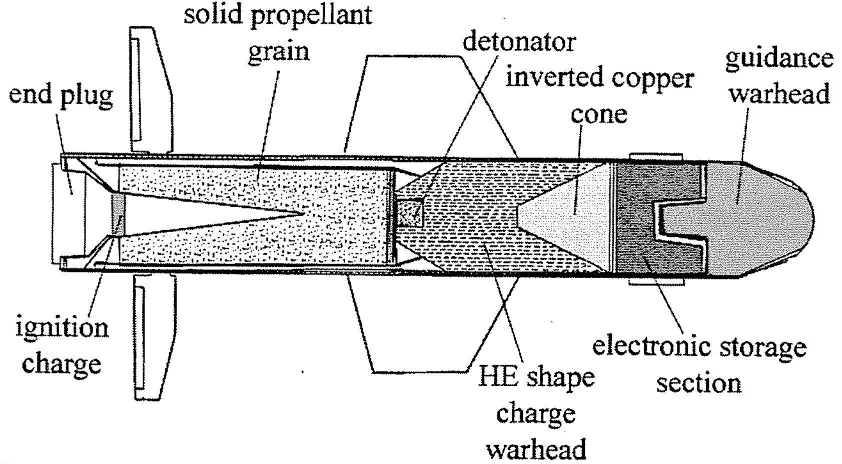
03-01-015A: High Performance impulse rocket propellant:
Into an extra large suitable mixing drum, bowl, blender, ect., equipped with motorized stirrer, place ***25 grams of Viton A*** (vinylidene fluoride), followed by ***250 grams of finely divided zirconium hydride***, followed by ***225 grams of ammonium perchlorate***, and then followed by 625 milliliters of acetone, and then close the mixing container to prevent evaporation of the acetone, and then blend the mixture at room temperature on high speed for about 10 to 15 minutes to form a uniform mixture. Thereafter, add in 1800 milliliters of hexane, and then continue to blend the mixture for about 10 to 15 minutes on moderate speed. After 10 to 15 minutes, stop the stirring process, and then allow the mixture to stand at room temperature for an hour or so. During which time, the propellant mixture will settle to the bottom of the mixing container. Thereafter, filter-off the insoluble propellant mixture, and then vacuum dry it, or air-dry it. Note: the acetone and hexane solvents can be recycled by distilling the solvent mixture to separate the acetone and hexane solvents. Once the filtered-off propellant composition has been collected and dried, it is ready for pressing. To do so, the dried propellant should be pressed into any desirable rocket motor, engine, mold, ect., under a typical pressure of 1500 or greater psi.
Burn rate: 0.5 to 0.54 inches per second at 1000 psi
Impulse: 237 pounds per square inch
Water resistance: Good.

Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***50% zirconium hydride, 45% ammonium perchlorate, 5% Viton A copolymer***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for various applications.

03-01-016A: High Performance Teflon based rocket propellant:
Into a suitable mixing drum, bowl, blender, ect., equipped with motorized stirrer, place ***45 grams of standard butyl rubber***, followed by ***15 grams of finely divided Teflon powder***, followed by ***95 grams of finely divided aluminum powder of standard mexh,*** followed by ***350 ammonium perchlorate***, and then followed by 150 milliliters of acetone, and then blend the mixture at room temperature until the bulk of the acetone evaporates. Thereafter, add in 250 milliliters of cold water, and then continue to blend the mixture for about 10 to 15 minutes on moderate speed. After 10 to 15 minutes, stop the stirring process, and then allow the mixture to stand at room temperature for an hour or so. During which time, the propellant mixture will settle to the bottom of the mixing container. Thereafter, filter-off the insoluble propellant mixture, and then dry it in a desiccator filled with metallic sodium. Once the filtered-off propellant composition has been collected and thoroughly dried, it is ready for pressing. To do so, the dried propellant should be pressed into any desirable rocket motor, engine, mold, ect., under a typical pressure of 3000 or greater psi.
Burn rate: 0.48 inches per second at 1000 psi
Burning rate pressure slope: 0.49
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can detonate, but only severe conditions.
Percentage: ***69.3% ammonium perchlorate, 18.8% aluminum powder, 8.9% butyl rubber, 2.9% Teflon, 0.10% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for various applications.

03-01-016B: High Performance Teflon based rocket propellant with reduced burn rate:
Into a suitable mixing drum, bowl, blender, ect., equipped with motorized stirrer, place ***45 grams of standard butyl rubber***, followed by ***15 grams of finely divided Teflon powder***, followed by ***95 grams of finely divided aluminum powder of standard mesh,*** followed by ***350 ammonium perchlorate***, followed by ***15 grams of triphenylphosphine,*** and then followed by 150 milliliters of hexane, and then blend the mixture at room temperature until the bulk of the hexane evaporates. Thereafter, place the semi-pasty mass onto a shallow tray, and allow it to air-dry but in a moist free environment. Afterwards, place the dried mass into a clean ball mill, filled with the usual Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 45 minutes. Thereafter, it is ready for pressing. To do so, the dried propellant should be pressed into any desirable rocket motor, engine, mold, ect., under a typical pressure of 3000 or greater psi.
Burn rate: 0.4 inches per second at 1000 psi
Burning rate pressure slope: 0.49
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***67.3% ammonium perchlorate, 18.2% aluminum powder, 8.6% butyl rubber, 2.8% Teflon, 2.8% triphenlyphosine burn reducer, 0.30% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for various applications.

Standard anti-tank missile design



Description/Details:

A typical wire guided missile for anti-tank purposes.

03-01-016C: High Performance Teflon based "smokeless" rocket propellant with reduced burn rate:
As in the previous procedure, place into a suitable mixing drum, bowl, blender, ect., equipped with motorized stirrer, ***35 grams of standard butyl rubber***, followed by ***80 grams of finely divided Teflon powder***, followed by ***385 ammonium perchlorate***, and then followed by 150 milliliters of hexane, and then blend the mixture at room temperature until the bulk of the hexane evaporates. Thereafter, place the semi-pasty mass onto a shallow tray, and allow it to air-dry. Afterwards, place the dried mass into a clean ball mill, filled with the usual Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 45 minutes. Thereafter, it is ready for pressing. To do so, the dried propellant should be pressed into any desirable rocket motor, engine, mold, ect., under a typical pressure of 3000 or greater psi.

Burn rate: 0.45 inches per second at 1000 psi
Burning rate pressure slope: 0.57
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can detonate, but only severe conditions.
Percentage: *77% ammonium perchlorate, 16% Teflon, 7% butyl rubber*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for various applications.

03-01-017A: High Performance smokeless polymer rocket propellant:
This procedure is identical to 03-03-09A, with the ammonium nitrate being replaced with ammonium perchlorate. Into a suitable mixing bowl, blender, or similar container equipped with motorized stirrer, place ***375 milligrams of finely powdered sulfur***, followed by ***1.5 grams of zinc oxide***, followed by ***10 grams of carbon black***, followed by ***9 grams of Milori blue agent***, followed by ***376.5 grams of ammonium perchlorate***, followed by ***500 milligrams of Aerosol-OT wetting agent*** (dioctyl ester of sodium sulfosuccinic acid), and then followed by ***1.5 grams of Flexamine antioxidant*** (25% diarylamine-ketone complex, and complex mixture of amines and phenols, commercially available), and then blend the mixture for about 10 to 15 minutes. Thereafter, add in ***50 grams of a copolymer*** composed of butadiene of 2-methyl-5-vinylpyridine, followed by ***10 grams of dibutoxyethoxyethyl formal plasticizer***, followed by ***500 milligrams of SA-113***, which is N,N-dimethyl-tertiary butyl sulfenyl dithiocarbamate vulcanization accelerator, and then continue to blend the mixture for about 15 minutes. After 15 minutes, the mixture is ready to be casted. To do so, pour, press, and vibrate the mixture into any desirable rocket engine, motor, mold, ect, under the usual techniques, and then cure the munitions in an oven at 76 Celsius for 7 to 14 days. Can be ignited using any standard high performance rocket ignition composition.

Burn rate: 0.21 to 0.25 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Very low.

Percentage: *81.8% ammonium perchlorate, 10.8% Butadiene copolymer, 2.1% dibutoxyethyoxyethyl formal plasticizer, 2.1% carbon black filler, 1.9% milori blue burning catalyst, 0.38% mixed residues, 0.32% zinc oxide catalyst, 0.32% flexamine antioxidant agent, 0.10% aerosol-OT wetting agent, 0.10% SA-113 vulcanization accelerator, 0.08% sulfur*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for high performance rockets, missiles, and take-off-assisted rocket packs.

03-01-018A: High Performance smokeless polymer rocket propellant:
This procedure is identical to 03-03-010A, but like the previous example, the ammonium nitrate is replaced by ammonium perchlorate. Into a suitable empty ball mill, place ***2.1 grams of magnesium oxide***, followed by ***41 grams of ammonium dichromate***, followed by ***375 grams of ammonium perchlorate***, followed by ***13.5 grams of Milori blue***, and then tumble the mixture at 50 to 100 RPM for about 30 to 40 minutes. Thereafter, or in the mean time, into a separate clean beaker, or similar container, equipped with motorized stirrer, place ***28 grams of a copolymer 1,3-butadiene-2-methyl-5-vinylpyridine***, and then begin to blend this rubbery polymer. Shortly thereafter, add in ***10.5 grams of Philblack E*** (a furnace black sold by the Phillips Petroleum Company), followed by ***27 grams of polybutadiene*** compound sold as "Butarez 15 plasticizer", and then continue to blend the mixture for about 5 minutes. After 5 minutes, immediately add all the dry ingredients from the ball mill, and then continue to blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready to be casted. To do so, it simply needs to be poured, pressed, and vibrated into any desirable rocket motor, engine, mold, ect, under the usual means, and then cure in an oven at 120 Celsius for about 3 hours. Can be ignited using any desirable means.

Burn rate: 0.41 to 0.44 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Very low.
Percentage: *75.4% ammonium perchlorate, 8.2% ammonium dichromate, 5.6% butadiene coplymer, 5.4% polybutadiene plasticizer, 2.7% milori blue burn catalyst, 2.1% philblack E furnace black, 0.42% magnesium oxide, 0.18% mixed residues*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-01-019A: High Performance ammonium perchlorate rocket propellant:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blades, place ***50 grams of finely powdered aluminum*** of average mesh, followed by ***100 grams of finely powdered magnesium*** of the usual mesh, and then followed by ***140 grams of ammonium perchlorate*** of average mesh. Immediately thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture on high speed to form a dough. Thereafter, the dough-like material is ready for use. To use, the dough simply needs to be pressed into any desirable rocket motor, engine, mold, ect., under the usual conditions, and the resulting engine or mold should be cured at room temperature, or moderate temperatures for several hours to several days. Should be ignited using a black powder charge or equivalent ignition composition.

Burn rate: 0.15 to 0.24 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: May explode under severe conditions.
Percentage: *48.2% ammonium perchlorate, 34.4% magnesium, 17.2% aluminum, 0.20% mixed residues*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-01-020A: High Performance ammonium perchlorate rocket propellant:
Into a suitable beaker, or similar mixing container, equipped with motorized stirrer in the usual means, place ***27.6 grams of glyceryl monoricinoleate (GMRO)***, followed by ***766 milligrams of diethanol oleamide (DEO)***, followed by ***16.8 grams of toluene diisocyanate (TDI)***, followed by 700 milliliters of acetone. Thereafter, blend the mixture for about 5 minutes at room temperature. Thereafter, add in ***600 grams of finely powdered boron***, followed by ***300 grams of ammonium perchlorate***, and then followed by ***766 milligrams of ferric acetyl acetonate***, and then continue to blend the mixture for about 30 to 40 minutes to form a homogenous mixture where no solid material settles out after stirring has stopped. Thereafter, pour and vibrate the fluidized mass into any desirable rocket motor, engine, ect., under the usual means, and then cure the devices in an oven at 60 Celsius until the acetone has evaporated and the rocket propellant has hardened—time vary.

Burn rate: 0.22 inches per second at 800 psi at 26 Celsius
Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8 (based on burn rate)

Ease of ignition (1 to 10): 7 ¾

Tendency to cake: None

Explosive ability: None.

Percentage: ***63.4% boron, 31.7% ammonium perchlorate, 2.9% glyceryl monoricinoleate, 1.77% toluene diisocyanate, 0.08% Ferric acetyl acetonate, 0.08% diethanol oleamide, 0.07% balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in medium velocity rocket motors for propelling artillery and mortar rounds to increase range.

03-01-021A: High Performance ammonium perchlorate rocket propellant:

Into a suitable beaker or similar container, equipped with motorized stirrer in the usual fashion, place ***116 grams of urea***, followed by ***227.5 grams of ammonium perchlorate***, followed by ***60 grams of lithium perchlorate***, and then heat the mixture to 80 to 85 celsius, and then stir the molten mixture for about 10 to 15 minutes. Thereafter, quickly add in ***39.95 grams of an epoxy binder*** called Unox 201 Epoxy resin, sold by Union carbide, followed by ***36.67 grams of polypropylene glycol***, followed by ***12.5 grams of tallow monoglyceride***, followed by ***6.8 grams of maleic anhydride***, and then followed by ***850 milligrams of tin octoate*** (containing 28% tin by weight), and then continue to blend the molten mixture on moderate speed for about 10 to 15 minutes to form a uniform mixture. Thereafter, pour and vibrate the molten mixture into any desirable rocket motor, engine, mold, ect., and then cure the munitions at 80 Celsius for 20 hours.

Burn rate: Undisclosed, but probably average for ammonium perchlorate propellants.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9 (based on rate of combustion)

Ease of ignition (1 to 10): 7+

Tendency to cake: None

Explosive ability: Moderate, only under severe conditions.

Percentage: ***45.47% ammonium perchlorate, 23.1% urea, 11.99% lithium perchlorate, 7.98% epoxy binder, 7.33% polypropylene glycol, 2.49% tallow monoglyceride, 1.35% maleic anhydride, 0.1699% tin octoate curing catalyst, 0.1201% balance (exact decimal places where removed to reduce complications).***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in high performance rockets and missiles for multiple uses.

03-01-022A: High Performance meltable-wax ammonium perchlorate rocket propellant:

Into a suitable beaker or similar container, equipped with motorized stirrer in the usual fashion, place ***95 grams of urea***, followed by ***372 grams of ammonium perchlorate***, and then followed by ***33 grams of polyethylene wax***, and then heat the mixture to 120 to 125 Celsius, and then stir the molten mixture at this temperature for about 10 to 15 minutes. Thereafter, the mixture is ready for use. To use, keep the molten mixture at 120 to 125 Celsius while pouring and vibrating the mixture into any desirable rocket motor, engine, ect., in the usual means, and then allow the munitions to cool at room temperature for 24 hours. Upon cooling, the mixture will solidify. Can be ignited by the usual means.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8 to 9 (based on rate of combustion)

Ease of ignition (1 to 10): 6 ¾

Tendency to cake: None

Explosive ability: Moderate, only under severe conditions.

Percentage: ***74.4% ammonium perchlorate, 19% urea, 6.6% wax***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in high performance rockets and missiles for multiple uses.

03-01-023A: High Performance polymeric ammonium perchlorate rocket propellant:

Into a suitable beaker or similar container, equipped with motorized stirrer in the usual fashion, place ***60 grams of urea***, followed by ***300 grams of ammonium perchlorate***, followed by ***86 grams of an epoxy binder*** called Unox 201 Epoxy resin, sold by Union carbide, and then followed by ***40 grams of aluminum powder*** of average mesh, and then heat the mixture to 80 to 90 Celsius, and once the mixture melts, blend it using the motorized stirrer for about 10 to 15 minutes to form a uniform mass. Thereafter, add in ***2 grams of tin octoate*** (containing 28% tin by weight), and then continue to blend the molten mixture on moderate speed for about 10 minutes. Thereafter, immediately pour and vibrate the molten mixture into any desirable rocket motor, engine, mold, ect., and then cure the munitions at 90 Celsius for 30 minutes. Note: polymerization will begin shortly after adding in the tin octoate.

Burn rate: Undisclosed, but probably average for ammonium perchlorate propellants.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9 (based on rate of combustion)

Ease of ignition (1 to 10): 7 ¾ (based on black powder ignition).

Tendency to cake: None

Explosive ability: Moderate, only under severe conditions.

Percentage: ***61.47% ammonium perchlorate, 17.6% epoxy binder, 12.29% urea, 8.19% aluminum, 0.409% tin octoate, and 0.111% balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in high performance rockets and missiles for multiple uses.

03-01-024A: High Performance ammonium perchlorate rocket propellant:

Into a suitable mixing container, blender, or similar device, equipped with motorized stirrer, place ***180 grams of diglycidyl ether***, followed by 360 milliliters of methylene chloride, and then blend the mixture for about 10 minutes to dissolve the diglycidyl ether. Thereafter, add in ***1020 grams of ammonium perchlorate*** of 250 to 300 mesh, followed by ***13.2 grams of triethylene tetramine***, and then continue to blend the mixture for about 60 to 70 minutes at room temperature. Thereafter, the mixture should be a tacky mass. Thereafter, the mixture is ready for use. To use, the tacky brittle mass needs to be pressed into any desirable rocket motor, engine, mold, ect., under a pressure of 1800 to 2400 psi. Thereafter, the munitions need to be placed into a vacuum apparatus, and a vacuum of 400 millimeters of mercury applied to evacuate air. Thereafter, the munitions need to be cured in an oven at 100 Celsius for about 4 hours. The cured propellant can be ignited using any standard means.

Burn rate: Not calculated, but typical for ammonium perchlorate propellants.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9 (based on rate of combustion)

Ease of ignition (1 to 10): 7 ½ (based on black powder ignition).

Tendency to cake: None

Explosive ability: Moderate, only under severe conditions.

Percentage: ***84% ammonium perchlorate, 14.8% diglycidyl ether, 1% triethylene tetramine, 0.2% balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in high performance rockets and missiles for multiple uses.

03-01-025A: High Performance and flexible, ammonium perchlorate rocket propellant with semicarbazide perchlorate burn increaser:

Step 1: Preparation of semicarbazide perchlorate

Into a suitable beaker or similar container, place 133.8 grams of semicarbazide hydrochloride, and then add in 1200 milliliters of water. Then stir the mixture to dissolve all the semicarbazide hydrochloride. Then, into a separate beaker or similar container, place 248.4 grams of silver perchlorate, followed by 600 milliliters of water. Thereafter, stir the mixture to dissolve all of the perchlorate. Thereafter, mix both solutions, and then stir the combine mixture for several minutes. Thereafter, filter-off the precipitated silver chloride, and then recrystallize the semicarbazide perchlorate from the filtered liquid (the semicarbazide will remain dissolved in the water). Note: removing the water under vacuum can be used to speed up the crystallization process. Once the crystalline semicarbazide perchlorate has been collected, it should be dissolved in hot methanol, and then precipitated by adding in 6 times the volume of water or methylene chloride. The collected precipitate should them vacuum dried or air-dried. Note: these crystals should then be ground in a ball mill to pulverize the crystals. The dried pulverized crystals are then suitable for use in step 2.

Step 2: Preparation of propellant composition

Into a suitable mixing bowl, equipped with motorized stirrer, place ***90 grams of Paraplex P-10 binder***, followed by ***45 grams of semicarbazide perchlorate of 40 to 80 mesh***, and then followed by ***165 grams of ammonium perchlorate of average mesh,*** and then rapidly and thoroughly blend the mixture for about 5 to 10 minutes to form a uniform mixture. Note: the Paralax P-10 may even begin to polymerize at room temperature so take note. After the 5 to 10 minute blending period, add in ***1.5 grams of benzoyl peroxide***, and then briefly, yet thoroughly, blend the mixture on rapid speed for about 30 seconds to 1 minute. Thereafter, immediately pour, press, and vibrate the mixture into any desirable rocket motor, engine, ect., and then allow the mixture to cure at room temperature for several days or more. The rocket propellant can be fired using any desirable ignition composition.

Burn rate: 0.35 inches per second at 1800 psi

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 10 (based on combustion).

Ease of ignition (1 to 10): 8

Tendency to cake: None

Explosive ability: May explode under severe conditions only.

Percentage: *54.7% ammonium perchlorate, 29.85% Paralax P-10 binder, 14.9% semicarbazide perchlorate, 0.497% benzoyl peroxide, 0.053% rounded balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance military and commercial rockets for multiple uses.

03-01-026A: High Performance ammonium perchlorate rocket propellant containing magnetic iron oxide burn catalyst:
Into a suitable mixing container, blender, or similar device, equipped with motorized stirrer, place *85 grams of nitrocellulose*, followed by *205 grams of ammonium perchlorate* of 250 to 300 mesh, followed by *145 grams of nitroglycerine*, followed by *40 grams of triacetin,* followed by *5 grams of 2-nitrodiphenylamine,* followed by *5 grams of resorcinol,* and then followed by *10 grams of magnetic iron-III-oxide,* and then gently blend the mixture for about 1 hour at room temperature. Thereafter, the mixture is ready for use. To use, the mass needs to be pressed into any desirable rocket motor, engine, mold, ect, under a pressure of 1800 to 2400 psi. Thereafter, the munitions need to be placed into an oven and cured at 40 to 50 Celsius for several hours. The cured propellant can be ignited using any standard means.
Burn rate: Not calculated, but typical for ammonium perchlorate propellants.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 7 ½ (based on black powder ignition).
Tendency to cake: None
Explosive ability: Moderate, only under severe conditions.
Percentage: *41.41% ammonium perchlorate, 29.29% nitroglycerine, 17.17% nitrocellulose, 8% triacetin, 2% magnetic iron-III-oxide catalyst, 1% 2-nitrodiphenylamine, 1% resorcinol, 0.13% balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets and missiles for multiple uses.

Note: Normally this procedure is safe, but inexperienced personnel should not attempt to prepare this rocket propellant unless maximum safety precautions are taken. Perform this operation using proper blast shielding.

03-01-027A: High Performance rubber-like ammonium perchlorate rocket propellant:
Into a suitable mixing container, blender, or similar device, equipped with motorized stirrer, place *75 grams of lithium aluminum hydride*, followed by *210 grams of ammonium perchlorate* of average mesh, followed by *500 milligrams of carbon black*, followed by *214.5 grams of a partially polymerized binder* (composed of 99.85% fluoroalkyl methacrylate monomer (*n* is 4 and R is CH3), and 0.15% benzoyl peroxide). Thereafter, blend the mixture for about 15 to 20 minutes at room temperature. Thereafter, the mixture is ready for use. To use, the mass needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual manner, and then the munitions need to be placed into an oven and first cured at 35 Celsius for 24 hours, followed by heating at 45 Celsius for 24 additional hours, and then heated at 55 Celsius for 120 hours. After the curing process, the propellant will be in the form a rubber-like mass. The cured propellant can be ignited using any standard means.
Burn rate: 0.10 to 0.15 at standard pressure
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6 ¾ (based on black powder ignition).
Tendency to cake: None
Explosive ability: Moderate, only under severe conditions.
Percentage: *42.9% polymerized binder, 42% ammonium perchlorate, 15% lithium aluminum hydride, 0.1% carbon black, 0.7% mixed residues*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets and missiles for multiple uses.

03-01-027B: High Performance rubber-like ammonium perchlorate rocket propellant:
Into a suitable mixing container, blender, or similar device, equipped with motorized stirrer, place *100 grams of finely pulverized aluminum*, followed by *275 grams of ammonium perchlorate* of average mesh, followed by *100 grams of a partially polymerized binder* (composed of 59.91% fluoroalkyl methacrylate monomer (*n* is 3 and R is CH3), and 39.94% fluoroalkyl methacrylate monomer (*n* is 4 and R is CH3), and 0.15% benzoyl peroxide. Thereafter, blend the mixture for about 15 to 20 minutes at room temperature. Thereafter, the mixture is ready for use. To use, the mass needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual manner, and then the munitions need to be placed into an oven and first cured at 50 Celsius for 72 hours, followed by heating at 70 Celsius for 24 hours, and then followed by heating at 85 Celsius for about 24 hours. After the curing process, the propellant will be in the form a rubber-like mass. The cured propellant can be ignited using any standard means.
Burn rate: 0.10 to 0.15 at standard pressure
Water resistance: Good.

Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6 ¾ (based on black powder ignition).
Tendency to cake: None
Explosive ability: Moderate, only under severe conditions.
Percentage: *57.89% ammonium perchlorate, 21% aluminum, 21% partially polymerized binder, 0.11% balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets and missiles for multiple uses.

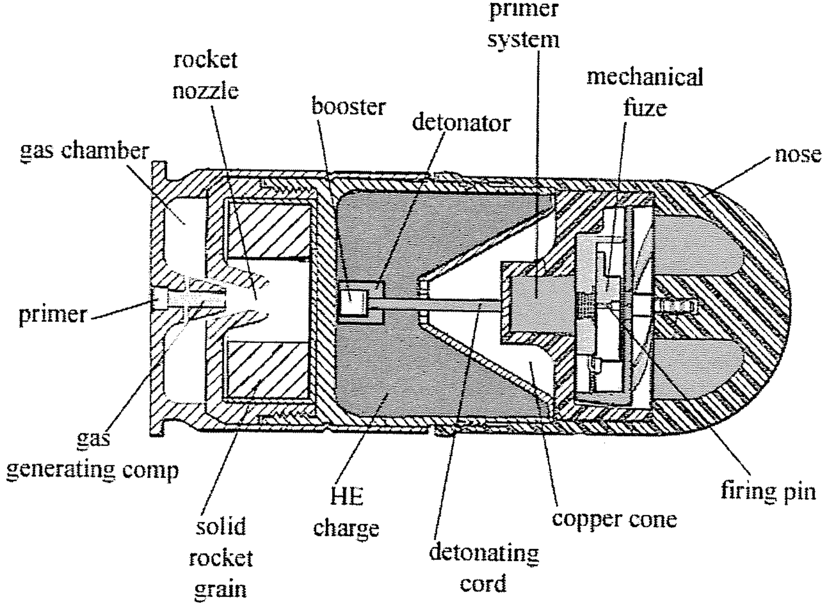
03-01-028A: High Performance ammonium perchlorate rocket propellant utilizing asphalt:
Into a suitable beaker of similar container, equipped with motorized stirrer, place *52.5 grams of asphalt* (with penetration values ranging from 7 to 9 millimeters per 5 seconds at 100 grams at a temperature of 720 Fahrenheit), and then heat the asphalt to 177 Celsius, and allow the asphalt to soften. Thereafter, add in *15 grams of cetyl acetamide*, followed by *40 grams of castor oil*, followed by *17.5 grams of dibutyl sebacate*, and then blend the mixture for about 10 to 15 minutes. Thereafter, add in, in small portions at a time while stirring, *375 grams of ammonium perchlorate*, and then continue to blend the mixture for about 15 minutes at 177 Celsius. Thereafter, the softened mixture is ready for casting. To do so, it simply needs to be presses into any desirable rocket motor, engine, mold, ect, in the usual fashion, and then allow to cool and harden. The hardened material can be ignited using any suitable means.
Burn rate: 0.10 at standard pressure
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 (based on rate of combustion)
Ease of ignition (1 to 10): 7 ¼ (based on black powder ignition).
Tendency to cake: None
Explosive ability: Moderate, only under severe conditions.
Percentage: *75% ammonium perchlorate, 10.5% asphalt, 8% castor oil, 3.5% dibutyl sebacate, 3% cetyl acetamide*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual uses.

03-01-029A: Specialty ammonium perchlorate semi-solid (gelled) rocket propellant:
Into a suitable beaker of similar container, equipped with motorized stirrer, place *447 grams of regular unleaded gasoline,* and then add in *53 grams of aluminum naphthenate* (containing 7.55% aluminum by weight). Thereafter, stir the mixture for about 10 to 15 minutes to form a gel. Thereafter, add in *75 grams of carbon black*, and then followed by *1425 grams of ammonium perchlorate*, and then blend the mixture for about 20 to 30 minutes. Thereafter, the tacky gel is ready for use. To do so, it simply needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual fashion. The gelled propellant mixture can be ignited using any suitable means. Note: test the bun rate using a small sample before committing to a rocket munition for safety—stories of rocket motors exploding without warning have been reported, so use caution.
Burn rate: Burns smoothly.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6 ¾ (based on black powder ignition).
Tendency to cake: None
Explosive ability: Normally none. Has been known to explode.
Percentage: *71.25% ammonium perchlorate, 22.35% unleaded gasoline, 3.75% carbon black, 2.65% aluminum naphthenate*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel rockets and missiles. Can also be used as a gas generator.

03-01-030A: Specialty high performance sterile ammonium perchlorate rocket propellant for use in space rockets:
Into a suitable beaker of similar container, equipped with motorized stirrer and contained in an ice bath chilled to 0 Celsius, place *6 grams of liquid ethylene oxide,* followed by *94 grams of polyurethane,* followed by *80 grams of finely powdered aluminum,* and then followed by *320 grams of ammonium perchlorate.* Thereafter, stir the mixture for about 15 minutes at a temperature below 5 Celsius. Thereafter, the mixture is ready for use. To do so, it simply needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual fashion, and then cured at 60 Celsius for 72 hours.
Burn rate: Good burn rate—average
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6 ½ (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible, but unlikely under most conditions.

Percentage: *64% ammonium perchlorate, 18.8% polyurethane, 16% aluminum, 1.2% ethylene oxide addition agent*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel space devices.

03-01-031A: Classic high performance ammonium perchlorate rocket propellant:
Into a suitable beaker of similar container, equipped with motorized stirrer, place *345 grams of ammonium perchlorate,* followed by *80 grams of finely powdered aluminum,* followed by *5 grams of red iron-III-oxide,* followed by *64.9 grams of Poly B-D R-45M),* followed by *4.45 grams of IPDI* (isophorone diisocyanate compound), and then followed by *650 milligrams of AO-2246* (2.2-methylenebis-4-methyl-6-tert-butylphenoland cure catalyst), and then heat and blend the mixture at 63 Celsius for nearly an hour. Immediately thereafter, the fluidized mixture is ready for casting. To do so, it simply needs to be poured and vibrated into any desirable rocket motor, engine, mold, ect, in the usual fashion, and then allowed to stand for several days or more.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 7 (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible.
Percentage: *69% ammonium perchlorate, 16% aluminum, 12.98% polymer binder, 1% iron oxide burn catalyst, 0.89% IPDI compound, 0.13% AO-2246 curing catalyst*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel projectiles, rockets, and missiles for multiple uses.

Rocket assisted 40mm grenade projectile	Details
 primer system rocket nozzle mechanical fuze booster detonator gas chamber nose primer gas generating comp firing pin HE charge copper cone solid rocket grain detonating cord	The adjacent illustration outlines the design of a 40mm projectile to extend its range by a short distance. The projectile consists of a small shape charge capable of penetrating about 2 inches of steel. The projectile is fired using a low-pressure low recoil system, where by gas fills the gas chamber producing pressure. The pressure forces the grenade down range. Centrifugal force arms the grenade after about 6 to 9 revolutions.

03-01-032A: High performance ammonium perchlorate rocket propellant:
Into a suitable beaker or similar heat resistant container, equipped with motorized stirrer, place *84 grams of polypropylene glycol,* followed by *1.35 grams of trimethylol propane*, followed by *2.5 grams of "Alosperse"*, which is a alkyl naphthalene sulfonate dispersion agent, followed by *1.25 grams of phenyl beta-naphthylamine.* Thereafter, blend the mixture at 60 Celsius for about 15 to 20 minutes under vacuum. Note: vacuum must be applied to de-gas the mixture. Thereafter, reduce the temperature to 43 Celsius, and then add in *10.7 grams of toluene diisocyante*, and then continue to blend the mixture at this temperature for about 15 to 20 minutes. Thereafter, stop the blending and then allow the mixture to stand at 35 Celsius for about 2 hours to allow the mixture to polymerize. After about 2 hours, place the mixture into a suitable beaker, and then chill the mixture in a dry bath for several hours. Thereafter, place the cold mixture into a ball mill, filled with 500 grams of Teflon coated heavy steel shot, and then tumble the mixture at 500 RPM for several hours to form a uniform pulverized mass. Thereafter pass the pulverized mass through a 300 mesh screen. Then place the 300 mesh mixture into a suitable beaker or similar container, and then add in *325 grams of ammonium perchlorate*, followed by *200 milligrams of ferric acetyl acetonate*, and then followed by *75 grams of aluminum powder* of average mesh, and then blend the mixture for about 20 to 30 minutes at 60 Celsius. Afterwards, the mixture is ready to use. To use, the tacky mass needs to be poured, presses, and vibrated into any desirable rocket motor, engine, mold, ect., in the usual fashion, and then cure the munitions at room

temperature for about 24 hours. Thereafter, cure the munitions in a freezer for 24 hours. Thereafter, the munitions can be fired using any suitable ignition mixture.
Burn rate: Very smooth. 0.2 to 0.23 at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6 ½ (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible.
Percentage: *65% ammonium perchlorate, 16.8% polypropylene glycol, 15% aluminum powder, 2.14% toluene diisocyante polymerization process, 0.5% alosperse, 0.27% trimethylol propane, 0.25% phenyl beta-naphthylamine, 0.04% possible moisture*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.

03-01-033A: High performance ammonium perchlorate rocket propellant:
Into a suitable beaker or similar heat resistant container, equipped with motorized stirrer, place *50 grams of polyvinyl chloride* (Geon Paste Resin 121), followed by *50 grams of dibutyl sebacate.* Thereafter, blend the mixture at room temperature for about 15 to 20 minutes. Thereafter, place the mixture into a suitable beaker or similar container, and then chill this mixture in a dry ice bath for several hours. Thereafter, remove the dry ice bath, and then add in *394 grams of ammonium perchlorate*, followed by *1 gram of dibutyl tin dilaurate*, and then blend the mixture for about 5 to 10 minutes. Now, the mixture is ready for use. To use, the mixture simply needs to be placed into any desirable rocket motor, and then the munitions need to be heated to about 60 to 90 Celsius to melt the mixture. When the mixture has melted, the munitions should be vibrated, and thereafter, allowed to cure at room temperature for 24 hours, and followed by curing in a freezer for 24 hours. Note: the mixture will expand and then de-expand when melted so this needs to be calculated for the dimensions of the rocket. The cured munitions can then be fired using any means.
Burn rate: Very smooth. 0.2 to 0.23 at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6 ½ (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible.
Percentage: *79.59% ammonium perchlorate, 10.1% dibutyl sebacate, 10.1% polyvinyl chloride, 0.2% dibutyl tin dilaurate, 0.01% possible moisture*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual uses.

03-01-034A: High performance smokeless ammonium perchlorate rocket propellant:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place *450 milligrams of chromium 2-ethylhexanoate*, followed *by 322 grams of a carboxy terminated polybutadiene* with a molecular weight of 5,000 and a specific gravity of 0.91 at 60 degrees Fahrenheit containing 1.0 to 1.5 percent 2,2'-methylene-bis(4-methyl-6-tertbutyl) phenol as antioxidant, followed by *18.5 grams of a diglycidyl ether of bisphenol A* (with an epoxy equivalent of 174 and 98 percent pure) with N,N-ortho-tris(epoxypropyl) p-aminophenol (with an epoxy equivalent of 97.4 and 96 percent pure), followed by *13 grams of dioctyl adipate*, followed by *13 grams of a polymer of butadiene* (containing a small amount of phenyl-beta-naphthylamine as stabilizer), thereafter followed by *830 grams of ammonium perchlorate* of average mesh, and then followed by *25 grams of aluminum powder* of average mesh. Thereafter, blend the mixture for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor or engine in the usual fashion. Thereafter, the munitions should be cured at room temperature for about 6 days.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6+ (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible.
Percentage: *67.9% ammonium perchlorate, 26.3% polybutadiene polymer, 2% aluminum, 1.5% diglycidyl ether, 1% butadiene polymer, 1% dioctyl adipate, 0.036% chromium compound catalyst, 0.264% balanced*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.

03-01-034B: High performance smokeless ammonium perchlorate rocket propellant (modified):

Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place ***750 milligrams of chromium 2-ethylhexanoate***, followed by ***322 grams of a carboxy terminated polybutadiene*** with a molecular weight of 5,000 and a specific gravity of 0.91 at 60 degrees Fahrenheit containing 1.0 to 1.5 percent 2,2'-methylene-bis(4-methyl-6-tertbutyl) phenol as antioxidant, followed by ***18 grams of a diglycidyl ether of bisphenol A*** (with an epoxy equivalent of 174 and 98 percent pure) with N,N-ortho-tris(epoxypropyl) p-aminophenol (with an epoxy equivalent of 97.4 and 96 percent pure), followed by ***26.5 grams of a polymer of butadiene*** (containing a small amount of phenyl-beta-naphthylamine as stabilizer), thereafter followed by ***830 grams of ammonium perchlorate*** of average mesh, and then followed by ***25 grams of aluminum powder*** of average mesh. Thereafter, blend the mixture for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor or engine in the usual fashion. Thereafter, the munitions should be cured at room temperature for about 6 days.

Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6+ (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible.
Percentage: ***67.9% ammonium perchlorate, 26.3% polybutadiene polymer, 2.1% polymer butadiene, 2% aluminum, 1.47% diglycidyl ether, 0.06% chromium compound catalyst, 0.17% balanced***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.

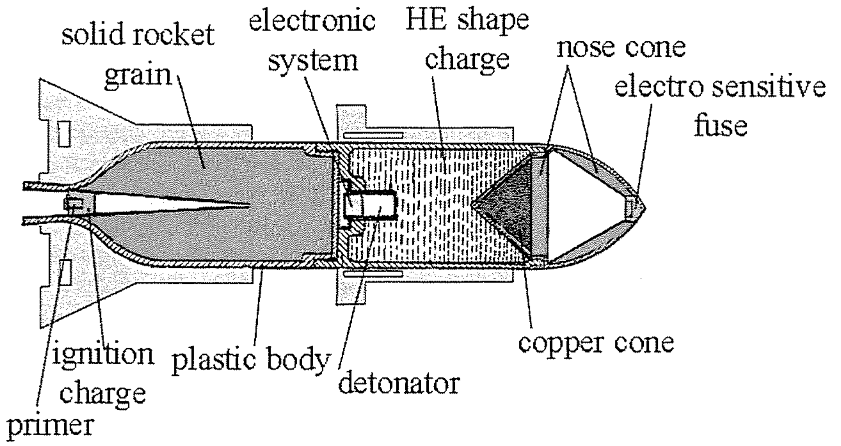
03-01-034C: High performance smokeless ammonium perchlorate rocket propellant (modified):
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place ***750 milligrams of chromium 2-ethylhexanoate***, followed ***by 322 grams of a carboxy terminated polybutadiene*** with a molecular weight of 5,000 and a specific gravity of 0.91 at 60 degrees Fahrenheit containing 1.0 to 1.5 percent 2,2'-methylene-bis(4-methyl-6-tertbutyl) phenol as antioxidant, followed by ***18 grams of 3,4-epoxycyclohexylmethyl carboxyl-3,4-epoxycyclohexane*** (with an epoxy equivalent of 130.6 and 96% pure) and the N,N-ortho-tris(epoxypropyl) p-aminophenol, followed by ***26.5 grams of a polymer of butadiene*** (containing a small amount of phenyl-beta-naphthylamine as stabilizer), thereafter followed by ***830 grams of ammonium perchlorate*** of average mesh, and then followed by ***25 grams of aluminum powder*** of average mesh. Thereafter, blend the mixture for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor or engine in the usual fashion. Thereafter, the munitions should be cured at room temperature for about 6 days.

Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion).
Ease of ignition (1 to 10): 6+ (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible.
Percentage: ***67.9% ammonium perchlorate, 26.3% polybutadiene polymer, 2.1% polymer butadiene, 2% aluminum, 1.47% epoxy compound, 0.06% chromium compound catalyst, 0.17% balanced***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.

03-01-035A: High performance smokeless ammonium perchlorate rocket propellant with copper sulfide burn accelerator:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot of the usual diameter, place ***1500 grams of ammonium perchlorate***, and then tumble the perchlorate at 400 RPM for about 30 minutes. Thereafter, add in ***260 grams of a hydroxyl terminated polybutadiene resin (Arco R45M),*** containing isophorone diisocyanate curing agent, and then add in ***40 grams of fine-grained copper-II-sulfide.*** Thereafter, seal the ball mill to make it air-tight, and then continue to tumble the mixture at 350 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, press and vibrate the mixture into any desired rocket motor, engine, ect., in the usual manner, and then cure the munitions in an oven at moderate temperature, or allow the composition to cure at room temperature. Once the composition is dry and hard, the outer layer of the propellant should be coated with a thin layer of carbon black—in this case, press and vibrate the mixture into a rocket mold.

Burn rate: 0.4 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.

Percentage: ***83.3% ammonium perchlorate, 14.44% polybutadiene resin, 2.22% copper-II-sulfide, 0.04% residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.

Rocket propelled projectile	Details
 solid rocket grain electronic system HE shape charge nose cone electro sensitive fuse ignition charge primer plastic body detonator copper cone	Another example of a rocket assisted anti-tank munition. The electro sensitive fuse works by generating an electric current upon impact.

03-01-035B: High performance ammonium nitrate rocket propellant with copper sulfide burn accelerator:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot of the usual diameter, place ***1500 grams of ammonium nitrate***, and then tumble the perchlorate at 400 RPM for about 30 minutes. Thereafter, add in ***260 grams of a hydroxyl terminated polybutadiene resin (Arco R45M),*** containing isophorone diisocyanate curing agent, and then add in ***40 grams of fine-grained copper-II-sulfide***. Thereafter, seal the ball mill to make it air tight, and then continue to tumble the mixture at 350 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, press and vibrate the mixture into any desired rocket motor, engine, ect., in the usual manner, and then cure the munitions in an oven at moderate temperature, or allow the composition to cure at room temperature. Once the composition is dry and hard, the outer layer of the propellant should be coated with a thin layer of carbon black—in this case, press and vibrate the mixture into any desired rocket mold.

Burn rate: 0.4 inches per second at 1000 psi
Water resistance: Good.
Stability: Moderate. May "cake-walk" on prolonged exposure (new term for becoming non-homogenous and fracturing on long exposure to moisture.
Flammability (1 to 10): 9 (based on rate of combustion).
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.
Percentage: ***83.3% ammonium nitrate, 14.44% polybutadiene resin, 2.22% copper-II-sulfide, 0.04% residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.

03-01-036A: High performance ammonium perchlorate rocket propellant with copper sulfide burn accelerator (aluminum based):
Into a suitable mixing bowl, or similar container, equipped wit motorized stirrer, place 500 milliliters of hexane, and then add in ***1500 grams of ammonium perchlorate*** (20 microns), and then blend the mixture to form a pasty mass. Thereafter add in ***260 grams of powdered aluminum***, followed by ***55 grams of copper sulfide***, and then blend the mixture on moderate speed for about 40 minutes. Thereafter, place the mixture onto a shallow pan or tray, and then allow the mixture to thoroughly air-dry. Note: a vacuum can be applied to remove the solvent faster. Thereafter, place the dried mass into a suitable ball mill, filled with 500 grams of Teflon coated heavy steel shot, and then tumble the mixture for about 3 hours to form a uniform powder. Thereafter, place this pulverized mass into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***150 grams of Epon 815 epoxy resin***, or any other desired liquid epoxy compound, and then blend the entire mixture the absence of air for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press and vibrate the mixture into any desired rocket engine, mold, ect., in the usual manner. Thereafter, allow the motors to cure at room temperature or in an oven at ordinary temperatures in the usual manner. Use typical ignition composition.

Burn rate: 0.3 to 0.4 inches per second at average psi
Water resistance: Good.
Stability: Typical.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6+
Tendency to cake: None

Explosive ability: Moderate—only under severe conditions.
Percentage: *76.33% ammonium perchlorate, 13.23% aluminum powder, 7.63% epoxy resin, 2.79% copper-II-sulfide, 0.02% impurities*
Classification: Deflagrating explosive (classified as propellant).
Use: For rockets and missiles for the usual propulsion needs.

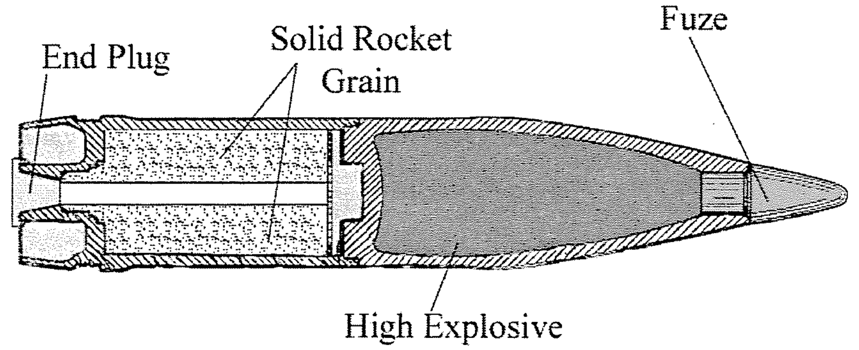
03-01-037A: High performance ammonium perchlorate rocket propellant (with metal hydride accelerator component):
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of the usual diameter, place ***1200 grams of ammonium perchlorate***, followed by ***120 grams of magnesium powder***, followed by ***50 grams of copper-II-chromite***, and then followed by ***70 grams of titanium hydride***. Thereafter, tumble the mixture at 150 RPM for about 2 hours in the absence of moisture. Thereafter, place this mixture into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner. Note: separate the tumbled mixture from the steel shot using a typical screen in the usual manner. Now, into the mixing bowl, place 500 milliliters of acetone, and then add in ***750 grams of ammonium nitrate***, followed by ***350 grams of sodium hydride***, and then blend the mixture on moderate speed to form a rough paste. Thereafter, place the mixture into a vacuum apparatus, and remove the solvent using a vacuum. Thereafter, place the dried mass into a suitable ball mill, filled with 500 grams of heavy steel shot, and then tumble the mixture for about 2 hours in the absence of air to form a uniform powder. Thereafter, place this pulverized mass into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***250 grams of Epon 815 epoxy resin***, or any other desired liquid epoxy compound, and then blend the entire mixture in the absence of air for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press and vibrate the mixture into any desired rocket engine, mold, ect., in the usual manner. Thereafter, allow the motors to cure at room temperature or in an oven at ordinary temperatures in the usual manner. Use typical ignition composition.
Burn rate: 0.21 inches per second at 1000 psi
Water resistance: Good.
Stability: Typical.
Flammability (1 to 10): 9 (based on rate of combustion).
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.
Percentage: *43.01% ammonium perchlorate, 26.88% ammonium nitrate, 12.54% sodium hydride, 8.96% epoxy resin, 4.2% magnesium powder, 2.5% titanium hydride, 1.79% copper-II-chromite burn rate catalyst, 0.12% residual impurities*
Classification: Deflagrating explosive (classified as propellant).
Use: For rockets and missiles for the usual propulsion needs.

03-01-038A: High performance ammonium perchlorate rocket propellant (with silicon monoxide accelerator component):
Into a suitable airtight mixing bowl, equipped with motorized stirrer, in the usual manner, place ***167 grams of butadiene-1,3,*** and then add in ***33 grams of methacrylic acid.*** Thereafter, blend the mixture to form a copolymer compound. Note: heat may be used to accelerate the process. Thereafter, add in ***1152 grams of ammonium perchlorate***, followed by ***8.8 grams of magnesium oxide***, and then followed by ***2 grams of silicon monoxide.*** Thereafter, blend the mixture at high speed for about 1 hour, in the absence of air. Thereafter, the mixture is ready for use. To use, press the mixture into any mold, rocket motor, ect., under a pressure of 850 psi, and at 74 Celsius. If desired, the propellant can be extruded through die cast machines to form grains of any desired diameter or size.
Burn rate: No data.
Water resistance: Good.
Stability: Typical.
Flammability (1 to 10): 9 (based on rate of combustion).
Ease of ignition (1 to 10): N/A
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.
Percentage: *84.53% ammonium perchlorate, 12.25% butadiene-1,3 binder, 2.42% methacrylic acid catalyst, 0.64% magnesium oxide filler, 0.146% silicon monoxide burn rate accelerator, 0.014% residual balance*
Classification: Deflagrating explosive (classified as propellant).
Use: For rockets and missiles for the usual propulsion needs.

03-01-038B: High performance ammonium perchlorate rocket propellant (with silicon monoxide and silicon nitride accelerator component):
Into a suitable airtight mixing bowl, equipped with motorized stirrer, in the usual manner, place ***167 grams of butadiene-1,3,*** and then add in ***33 grams of stearic acid.*** Thereafter, blend the mixture to form a copolymer compound. Note: heat may be used to accelerate the process. Thereafter, add in ***1152 grams of ammonium perchlorate***, followed by ***4 grams of magnesium oxide***, and then followed by ***12 grams of silicon monoxide***. Thereafter, blend the mixture at high speed for about 1 hour, in the absence of air. Thereafter, quickly add in ***60 grams of sulfur***, followed by ***45 grams of potassium dichromate***, and then followed by ***35 grams of silicon nitride***, and then continue to blend the mixture in the absence of air. Thereafter, the mixture is ready for use. To use, press the mixture into any mold, rocket motor, ect., under a pressure of 850 psi, and at 74 Celsius. If desired, the propellant can be extruded through die cast machines to form grains of any desired diameter or size.

Burn rate: No data, but probably typical for ammonium perchlorate based propellants.
Water resistance: Good.
Stability: Typical.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): N/A
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.
Percentage: *76.39% ammonium perchlorate, 11.07% butadiene-1,3, 3.97% sulfur, 2.98% potassium dichromate, 2.25% silicon nitride, 2.18% stearic acid, 0.79% silicon monoxide, 0.26% magnesium oxide filler, 0.11% residual balance*
Classification: Deflagrating explosive (classified as propellant).
Use: used in rockets and missiles for the usual purposes.

Rocket assisted artillery shell



Description/Details:
The above illustration shows the rocket grain, and explosive payload. The rocket is merely fired upon firing from the cannon and the resulting gas pressure produced by the propellant grain ignites the rocket grain. As previously stated, rocket assisted artillery shells have ranges extended by 5 to 10 kilometers on average.

03-01-039A: High performance castable ammonium perchlorate rocket propellant:
Into a suitable beaker, equipped with motorized stirrer, place ***170 grams of finely powdered PVC,*** followed by ***45 grams of dioctyl sebacate,*** and then followed by ***1100 grams of ammonium perchlorate.*** Thereafter, blend the mixture at moderate speed for about 2 hours to form a uniform mixture. Thereafter, heat the mixture to 177 Celsius and blend the mixture until the mixture fuses. Once the mixture fuses, continue to blend the mixture for about 5 to 10 minutes. Immediately thereafter, the mixture is ready for use. To use, press and vibrate the fused mixture into any mold, rocket motor, ect., and then allow the munitions to cool and set.
Burn rate: Average.
Water resistance: Good.
Stability: Typical.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): N/A
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.
Percentage: *83.65% ammonium perchlorate, 12.92% PVC, 3.42% dioctyl sebacate, 0.01% mixed impurities*
Classification: Deflagrating explosive (classified as propellant).
Use: used in rockets and missile for the usual purposes.

03-01-039B: High performance castable ammonium perchlorate rocket propellant (with silicon nitride and calcium carbide burn enhancer):
Into a suitable beaker, equipped with motorized stirrer, place ***190 grams of finely powdered PVC,*** followed by ***56 grams of dioctyl sebacate,*** and then followed by ***1250 grams of ammonium perchlorate.*** Thereafter, blend the mixture for 30 minutes to form a uniform mixture. Thereafter, add in ***50 grams of silicon nitride***, and then followed by ***45 grams of calcium carbide***, and then continue to blend the mixture for about 15 minutes. Thereafter, heat the mixture to around 177 Celsius and blend the mixture until the mixture fuses. Once the mixture fuses, continue to blend the mixture for about 5 to 10 minutes. Immediately thereafter, the mixture is ready for use. To use, press and vibrate the fused mixture into any mold, rocket motor, ect., and then allow the munitions to cool and set.
Burn rate: Average.
Water resistance: Good—keep away from moisture.
Stability: Typical.

Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.
Percentage: *78.56% ammonium perchlorate, 11.94% ammonium perchlorate, 3.52% dioctyl sebacate, 3.14% silicon nitride, 2.83% calcium carbide, 0.01% impurities*
Classification: Deflagrating explosive (classified as propellant).
Use: used in rockets and missile for the usual purposes.

03-01-040A: High Performance ammonium perchlorate rocket propellant with nitrocellulose base:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***200 grams of triacetin***, followed by ***50 grams of tri-butoxyethyl phosphate***, followed by ***250 grams of nitrocellulose (average nitrogen content)***, and then followed by ***2.5 grams of lecithin***. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a nice slurry. Thereafter, add in ***460 grams of ammonium perchlorate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 70 Celsius for about 2 days. A standard ignition composition can be used for proper burn.
Burn rate: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7
Tendency to cake: None
Explosive ability: Stable.
Percentage: *47.79% ammonium perchlorate, 25.97% nitrocellulose, 20.77% triacetin, 5.19% tri-butoxyethyl phosphate, 0.25% lecithin, 0.03% balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-01-040B: High Performance ammonium perchlorate rocket propellant with nitrocellulose base:
First, into a clean mixing bowl, equipped with motorized stirrer, place ***210 grams of nitrocellulose***, followed by ***37.5 grams of nitroglycerine***, and then followed by ***2.5 grams of diphenyl amine***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, into a separate suitable mixing bowl, equipped with motorized stirrer, place ***150 grams of triacetin***, followed by ***100 grams of methyl phthalyl ethyl glycolate***, followed by the 250 grams of nitrocellulose mixture prepared earlier, and then followed by ***2.5 grams of lecithin***. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a nice slurry. Thereafter, add in ***470 grams of ammonium perchlorate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 70 Celsius for about 7 days. A standard ignition composition can be used for proper burn. If desired, the mixture can be extruded from any desired die cast machine to form grains of various sizes for use as a high performance gun propellant.
Burn rate: 0.25 to 0.4 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 6 to 7
Tendency to cake: None
Explosive ability: Stable.
Percentage: *48.32% ammonium perchlorate, 21.59% nitrocellulose, 15.42% triacetin, 10.28% methyl phthalyl ethyl glycolate, 3.85% nitroglycerine, 0.25% lecithin, 0.25% diphenyl amine, 0.04% residual balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses and as a gun propellant.

03-01-040C: High Performance ammonium perchlorate rocket propellant with nitrocellulose base:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***192 grams of triacetin***, followed by ***288 grams of diethyl phthalate***, followed by ***480 grams of nitrocellulose (average nitrogen content)***, followed by ***20 grams of lecithin***, and then followed by ***1680 grams of ammonium perchlorate***, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 75 Celsius for about 2 days. A standard ignition composition can be used for proper burn. If desired, the mixture can be extruded from any desired die cat machine to form grains of various sizes for use as a high performance gun propellant.

Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Stable.
Percentage: *63.15% ammonium perchlorate, 18.04% nitrocellulose, 10.82% diethyl phthalate, 7.21% triacetin, 0.75% lecithin, 0.03% residual balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses and as a gun propellant.

03-01-040D: High Performance ammonium perchlorate rocket propellant with nitrocellulose base:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***250 grams of bis-(3,5,5-trimethoxyhexyl) adipitate***, followed by ***250 grams of diethyl phthalate***, followed by ***500 grams of nitrocellulose (average nitrogen content)***, followed by ***25 grams of lecithin***, and then followed by ***1000 grams of ammonium perchlorate***, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 75 Celsius for about 2 days. A standard ignition composition can be used for proper burn. If desired, the mixture can be extruded from any desired die cast machine to form grains of various sizes for use as a high performance gun propellant.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Stable.
Percentage: *49.38% ammonium perchlorate, 24.69% nitrocellulose, 12.34% diethyl phthalate, 12.34% bis-(3,5,5-trimethoxyhexyl) adipitate, 1.23% lecithin, 0.02% residual impurities*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses and as a gun propellant.

03-01-041A: Specialty high Performance ammonium perchlorate rocket propellant:
Into a suitable beaker, place 400 milliliters of methanol, and then add and dissolve 43 grams of tris-1-(2-methyl aziridinyl) phosphine oxide, and then followed by 15 grams of tartaric acid. Thereafter, gently blend the mixture at room temperature for about 3 days. Thereafter, place this mixture into a suitable vacuum apparatus, and remove the methanol under vacuum. Now, into a suitable mixing bowl, equipped with motorized stirrer, place ***272 grams of ammonium perchlorate***, followed by ***64 grams of aluminum powder***, and then add in ***62.9 grams of a hydroxy-terminated liquid polybutadiene diisocyanate compound containing dioctyl adipate***, and then finally add in ***1.2 grams of the stock tartaric acid mixture*** previously prepared. Thereafter, blend the entire mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed, and vibrated into any desired rocket motor, mold, engine ect., in the usual manner, and then cured in an oven at moderate temperature until dry and hard. The propellant can be fired using any suitable means in the usual manner.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Stable.
Percentage: *67.9% ammonium perchlorate, 15.99% aluminum powder, 15.72% hydroxy terminated liquid resin binder, 0.2999% polymerized tartaric acid compound, 0.0901% residue*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses and as a gun propellant.

03-01-042A: High Performance ammonium perchlorate rocket propellant:
Into a suitable beaker or similar container, place ***248 grams of ammonium perchlorate***, followed by ***246 grams of polychlorotrifluoroethylene***, and then followed by ***6 grams of paraffin wax***. Thereafter, heat the mixture to about 100 Celsius, and blend the mixture thoroughly all throughout the heating process. Continue to heat the mixture in molten form for about 15 to 20 minutes. Thereafter, the mixture is ready for casting. To do so, it needs to be poured, and vibrated into any desired rocket motor,

casing, mold, engine, ect., and then allow the munitions to cool at room temperature. The propellant can be fired using any suitable means in the usual manner.
Burn rate: 0.17 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): unknown
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***49.6% ammonium perchlorate, 49.2% polychlorotrifluoroethylene copolymer, 1.2% paraffin wax binder***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.

03-01-043A: High performance low temperature burning smokeless propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place 88.5 grams of adipic acid, followed by 86 grams of diethylene glycol, and then followed by 3.5 grams of maleic anhydride. Thereafter, blend the mixture for about 10 minutes. Thereafter, place ***35.8 grams of this adipic acid/diethylene glycol/maleic anhydride mixture*** into a clean separate mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***850 grams of ammonium perchlorate***, followed by ***93.3 grams of n-butyl acrylate,*** followed by ***14.4 grams of methyl acrylate***, and then blend this mixture for about 10 minutes on moderate speed. Finally, add in ***4 grams of methyl amyl ketone peroxide,*** and then followed by ***2.5 grams of lecithin***. Thereafter, continue to blend the mixture on moderate speed for about 30 minutes at room temperature. Finally, the mixture is ready for casting. To do so, the mixture should be poured and pressed into any desirable rocket motor, engine, mold, ect., under mild pressure, and the following munitions should then be cured in an oven at 105 Celsius for 24 to 48 hours.
Burn rate: Unknown.
Combustion temperature: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***85% ammonium perchlorate, 9.33% n-butyl acrylate binder, 3.58% polyester binder compound, 1.44% methyl acrylate binder, 0.4% methyl amyl ketone peroxide cure catalyst, 0.25% lecithin wetting agent***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in rockets and missiles for the usual manner. Preferably used in wire guided missiles.

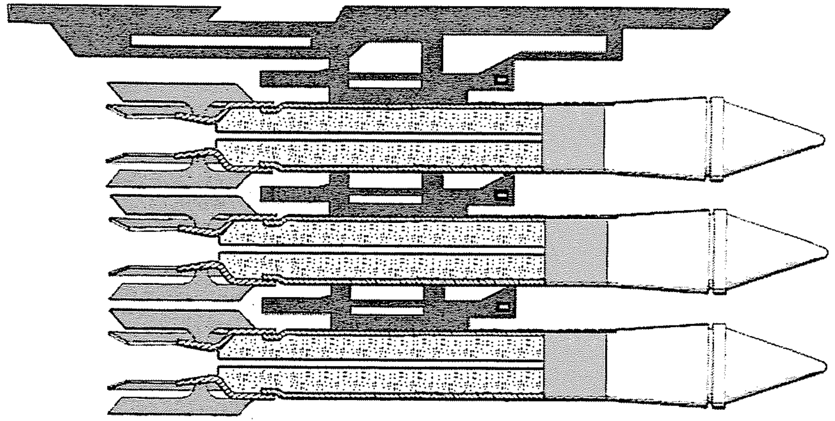
03-01-043B: High performance moderate temperature burning smokeless propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place 74 grams of adipic acid, followed by 70.5 grams of diethylene glycol, and then followed by 5.3 grams of maleic anhydride. Thereafter, blend the mixture for about 10 minutes. Thereafter, place ***123.5 grams of this adipic acid/diethylene glycol/maleic anhydride mixture*** into a clean separate mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***750 grams of ammonium perchlorate***, followed by ***123.5 grams of styrene,*** and then blend this mixture for about 10 minutes on moderate speed. Finally, add in ***2.5 grams of cumene hydroperoxide,*** and then followed by ***500 milligrams of lecithin***. Thereafter, continue to blend the mixture on moderate speed for about 30 minutes at room temperature. Finally, the mixture is ready for casting. To do so, the mixture should be poured and pressed into any desirable rocket motor, engine, mold, ect., under mild pressure, and the following munitions should then be cured in an oven at 105 Celsius for 24 to 48 hours.
Burn rate: Unknown.
Combustion temperature: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% ammonium perchlorate, 12.35% polyester binder, 12.35% styrene, 0.25% cumene hydroperoxide cure catalyst, 0.05% lecithin wetting agent***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in rockets and missiles for the usual manner. Preferably used in wire guided missiles.

03-01-044A: High performance smokeless propellant:

Into a suitable mixing bowl, equipped with motorized stirrer, place ***250 grams of finely divided PVC*** (Geon 121), followed by ***10 grams of barium ricinoleate***, and then followed by ***250 grams of dibutyl sebacate***, and then blend the mixture for about 5 minuets to form a uniform mixture. Thereafter, add in ***1530 grams of ammonium perchlorate***, and then continue to blend the mixture for about 45 minutes at high speed. Thereafter, the fluidized mixture is ready for casting. To do so, the mixture should be poured and vibrated into any desirable rocket motor, engine, mold, ect., and the following munitions should then be cured in an oven at 175 Celsius for several hours or until the propellant is dry and hard.
Burn rate: 0.10 inches per second at standard pressure. 0.50 inches per second at 2,000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% ammonium perchlorate, 12.25% PVC, 12.25% dibutyl sebacate, 0.49% barium ricinoleate stabilizer, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in rockets and missiles for the usual purposes.

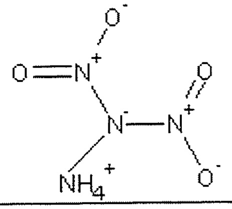
03-01-045A: High performance smokeless propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***2.7 grams of trimethylol propane***, followed by ***168 grams of polypropylene glycol***, followed by ***2.5 grams of phenyl beta-naphthylamine***, followed by ***5 grams of "alrosperse"*** (alkyl naphthalene sulfonate dispersing agent), and then followed by ***400 milligrams of ferric acetyl acetonate***. Thereafter, heat the mixture to 60 Celsius, and then blend the mixture at this temperature for 45 to 50 minutes under moderate vacuum to de-gas the mixture and remove moisture. Note: extra time may be needed to fully remove the water. Thereafter, remove the vacuum, and then reduce the temperature of the mixture to about 45 Celsius, and then add in ***21.4 grams of toluene diisocyante***, followed by ***650 grams of ammonium perchlorate***, and then followed by ***150 grams of aluminum powder*** of average mesh. Thereafter, blend the mixture in the absence of air for about 5 to 10 minutes under vigorous speed. Thereafter, the semi-fluidized mass is ready for casting. To do so, the mixture should immediately be poured and vibrated into any desirable rocket motor, engine, mold, ect., and the following munitions should then be cured in an oven at 35 Celsius for several hours to allow for proper polymerization.
Burn rate: 0.34 inches per second at 1500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***65% ammonium perchlorate, 16.8% polypropylen glycol plasticizer, 15% aluminum powder, 2.14% toluene diisocyante polymerization catalyst, 0.5% "alosperse" polymerization agent, 0.27% trimethylol propane binder aid, 0.25% phenyl beta-naphthylamine binder catalyst, 0.04% ferric acetyl acetonate catalyst***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in rockets and missiles for the usual purposes.

03-01-046A: Specialty high Performance polymer-based rocket propellant:
Into a suitable ball mill or vertical mixer, place ***94 grams of polyurethane,*** followed by ***80 grams of aluminum powder***, and then followed by ***320 grams of ammonium perchlorate***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***6 grams of ethylene oxide***. Thereafter, blend the mixture on high speed for about 45 minutes in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable rocket motor, mold, engine, ect., and then cured in an oven at 60 Celsius for about 72 hours.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on average burn rate).
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***64% ammonium perchlorate, 18.8% polyurethane, 16% aluminum powder, 1.2% ethylene oxide polymerization agent***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual means.

Multiple launch system (commonly found on helicopters)

Details:
The above illustration outlines a multiple rocket system, commonly found on helicopters or similar aircraft. These types of rockets are unguided, meaning they have no influence by laser or wire guidance. Un-guided rockets can be potent, but are less accurate.

Section 2: Ammonium Dinitramide (ADN) Rocket Propellants

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN	
	
ADN is a relatively new high-energy compound that has great interest and future potential. The potassium salt of ADN was first synthesized in 1971, and since then the research into ADN and its salts has expanded—many other salts have been prepared. ADN forms colorless to white to lightly yellowish crystals, which are more then adequate for replacing ammonium perchlorate in high performance solid rocket propellants. ADN shows great importance for rocket propellants and high performance gun propellants as it increases overall thrust, and decreases smoke and flash emissions. It also shows potential for clean burning firework and other pyrotechnic compositions.	
Method of Preparation 1: Step 1: Preparation of urea nitrate	**Method of Preparation 2:** Add and dissolve 30 grams of nitronium tetrafluoroborate into 250 milliliters of acetonitrile,

To a 200-milliliter beaker place 100 grams of 33% diluted nitric acid, and then add 28 grams of urea in small portions while stirring the 33% nitric acid vigorously. During the addition of the urea, the reaction temperature does not show any practical rise, so this reaction can be carried out at room temperature without cooling means. Immediately upon addition, urea nitrate forms as crystals. After the addition of the urea, allow the reaction mixture to stand for 20 minutes, and then filter the mixture to collect the urea nitrate crystals. Wash the crystals with 100 milliliters of cold water, and then vacuum dry or air-dry. The yield will be 47.6 grams of urea nitrate with a melting point of 162 Celsius.

Step 2: Preparation of nitro urea

Place 168 milliliters of 98% sulfuric acid into a 400-milliliter 3-necked flask, which is equipped with a thermometer, and stirrer. Then cool the flask to -5 Celsius by means of an ice/salt bath. Then add and dissolve in small portions, 47.6 grams of urea nitrate (prepared in step 2) while stirring the 98% sulfuric acid. After the addition of the urea nitrate, stir the mixture for an additional 1 hour, and then pour the entire reaction mixture onto 300 grams of crushed ice contained in a beaker. After the ice melts, collect the crystals of nitrourea by filtration. After which, wash the crystals with 100 milliliters of ice cold water, and then vacuum dry or air-dry. The yield will be 32.4 grams of nitrourea with a melting point of 159 Celsius. Note: Since nitrourea dissolves easily in water, the yield is improved more by taking sufficient care when washing with cold water.

Step 3: Preparation of ADN

Mix the nitrourea (prepared in step 2) with 200 milliliters of acetonitrile, and then cool the mixture with an ice bath while stirring vigorously. To this stirred solution, gradually add 40.94 grams of the nitration reagent, nitronium tetrafluoroborate. In a short time, the solution becomes clear. After addition of the nitronium tetrafluoroborate, let the reaction mixture stand for about 1 hour. After this 1-hour period, pass 20 to 30 grams of ammonia gas into the reaction mixture. Stop the addition of the ammonia gas when the odor of ammonia can be detected. After the addition of ammonia, filter-off the by-product solids. Now, evaporate the filtered reaction mixture to concentrate it (no heat; preferably use a rotary evaporator if available). To concentrate the reaction mixture, evaporate the reaction mixture up-to-the-point where a very small amount of solid begins to precipitate. When a small amount of solid begins to precipitate, stop the evaporation process, and then mix the reaction mixture with 200 milliliters of ethyl acetate and stir for 2 minutes. After adding the ethyl acetate, if any precipitate is formed, filter it off because it will be by-product solids. Then concentrate the reaction mixture by evaporation in the same manner as before (no heat; preferably use a rotary evaporator if available). During the evaporation of the reaction mixture, when a tiny amount of

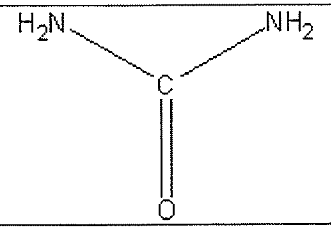
and then cool the mixture to -20 Celsius by means of a dry ice/acetone bath. Thereafter, gradually add 8 grams of ammonium carbamate over a period of time sufficient to keep the temperature of the nitronium tetrafluoroborate at -20 Celsius. During the addition, rapidly stir the acetonitrile. After the addition, stir the reaction mixture for 60 minutes at -20 Celsius. During the 60 minute stirring period, prepare a mixture by adding and dissolving 26 grams of anhydrous ammonia into 480 milliliters of isopropyl alcohol, and then add this ammonia solution to 2 liters of diethyl ether and stir the mixture rapidly for several minutes. Then, after the 60-minute heating period of the nitronium tetrafluoroborate/ammonium carbamate mixture, add this nitronium tetrafluoroborate mixture into the ammonia/diethyl ether mixture while stirring the ammonia/diethyl ether mixture rapidly. After the addition, continue to stir for about 50 minutes. After 50 minutes, stop stirring, and then place the mixture into a rotary evaporator, and evaporate the reaction mixture to dryness. Afterwards, remove the dry solid from the rotary evaporator and then dissolve into a solvent mixture prepared by mixing 50 milliliters of acetone with 50 milliliters of ethyl acetate with stirring. Thereafter, filter-off any insoluble impurities, and then place the filtered liquid into a clean rotary evaporator, and evaporate the filtered mixture to dryness. After which, remove the dry product from the rotary evaporator, and then recrystallize the dry product from 20 milliliters of butanol. The collected solid is then dried under vacuum to yield 1.5 grams of high purity ammonium dinitramide.

Method of Preparation 3: Dissolve 10 grams of KDN into 20 milliliters of water. Then prepare a second solution by dissolving 10 grams of ammonium sulfate into 20 milliliters of water. Thereafter, mix these two solutions with stirring. A white precipitate of potassium sulfate will immediately form. After mixing both solutions, stir the reaction mixture for several minutes. After which, add 200 milliliters of isopropyl alcohol, and stir the mixture for several minutes. Then, filter-off the precipitated potassium sulfate, and then place the filtered reaction mixture into a rotary evaporator and evaporate-off the isopropyl alcohol under vacuum. If a rotary evaporator is unavailable, place the reaction mixture into a shallow pan, and then blow air over the surface until a moist solid remains. When a moist solid is obtained, collect the moist solid, and then re-dissolve into 300 milliliters of isopropyl alcohol. Thereafter, add 300 milliliters of petroleum ether and stir the mixture for several minutes. After which, filter-off the precipitated ADN, and then vacuum dry or air-dry the solid.

solid begins to precipitate, stop the evaporation and then add 200 milliliters of chloroform. After the addition of the chloroform, filter-off the precipitated product, and then vacuum dry or air-dry.

Note: Many other salts of ADN can be prepared by replacing dry ammonia gas with another base such as metal hydroxides or carbonates—preferably carbonates rather then hydroxides as strong hydroxides may decrease yields as the result of hydrolysis.

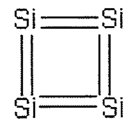
46. Urea Nitrate



Urea Nitrate forms colorless, odorless leaflets with a melting point of 152 Celsius. The crystals are insoluble in cold water, but soluble in hot. The nitrate has been known to explode when struck or rubbed while heating.

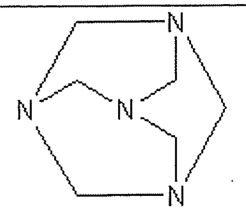
Method of preparation 1: To a 200-milliliter beaker place 100 grams of 33% diluted nitric acid, and then add 28 grams of urea in small portions while stirring the 33% nitric acid vigorously. During the addition of the urea, the reaction temperature does not show any practical rise, so this reaction can be carried out at room temperature without cooling means. Immediately upon addition, urea nitrate forms as crystals. After the addition of the urea, allow the reaction mixture to stand for 20 minutes, and then filter the mixture to collect the urea nitrate crystals. Wash the crystals with 100 milliliters of cold water, and then vacuum dry or air-dry. The yield will be 47.6 grams of urea nitrate with a melting point of 162 Celsius.

47. Silicon Powder



Silicon powder is a black to grayish material. The powder is stable at room temperature and is much more resistant to chemical attack then other powders. It is insoluble in water and the usual solvents.

48. Hexamine

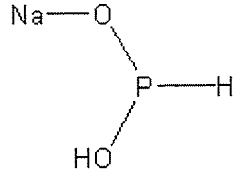


Hexamine, also known as methenamine, forms colorless to white crystals, granules, or powder. The melting point cannot be calculated at the crystals sublime upon heating. Hexamine is soluble in water, and slightly soluble in alcohol, but insoluble in most other solvents under the usual means.

49. Boron powder

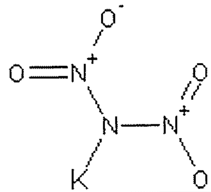
Boron powder is black to grayish-black material with a beautiful metallic luster. The powder is insoluble in water and the usual organic solvents. Boron powder is much less reactive then other powdered metals, but is capable of reacting with acids and bases.

50. Sodium hypophosphite



Sodium hypophosphite forms a monohydrate, which is a white, odorless granules or crystalline solid. The salt decomposes when strongly heated into phosphine, which

51. KDN



Method of Preparation 1: Add and dissolve 30 grams of nitronium tetrafluoroborate into 250 milliliters of acetonitrile, and then cool the mixture to -20 Celsius by means of a dry bursts into flames. The salt is soluble in water, alcohol, and glycerol, but relatively insoluble in most organic solvents. Sodium hypophosphite can explode when mixed with a strong oxidizing agent and ignited.

ice/acetone bath. Thereafter, gradually add 8 grams of ammonium carbamate over a period of time sufficient to keep the temperature of the nitronium tetrafluoroborate at -20 Celsius. During the addition, rapidly stir the acetonitrile. After the addition, stir the reaction mixture for 60 minutes at -20 Celsius. During the 60-minute stirring period, prepare a mixture by adding and dissolving 208 grams of potassium carbonate into 420 milliliters of warm water, and then add this solution to 2 liters of diethyl ether with rapid stirring of the ether. Then, after the 60-minute heating period of the nitronium tetrafluoroborate/ammonium carbamate mixture, add this nitronium tetrafluoroborate mixture into the potassium carbonate/diethyl ether mixture while stirring the potassium carbonate/diethyl ether mixture rapidly. After the addition, continue to stir for about 50 minutes. After 50 minutes, stop stirring, and then place the mixture into a rotary evaporator, and evaporate the reaction mixture to dryness. Afterwards, remove the dry solid from the rotary evaporator and then dissolve into a solvent mixture prepared by mixing 50 milliliters of acetone with 50 milliliters of ethyl acetate with stirring. Thereafter, filter-off any insoluble impurities, and then place the filtered liquid into a clean rotary evaporator, and evaporate the filtered mixture to dryness. After which, remove the dry product from the rotary evaporator, and then recrystallize the dry product from 20 milliliters of butanol. The collected solid is then dried under vacuum to yield 1.5 grams of high purity potassium dinitramide.

Method of Preparation 2:

Step 1: Preparation of the potassium salt of Sulfamic Acid

Prepare a suspension by adding 140.7 grams of sulfamic acid into 100 milliliters of water. Prepare a second mixture by dissolving 88 grams of potassium hydroxide into 100 milliliters of water. Thereafter, add the potassium hydroxide solution to the sulfamic acid suspension with rapid stirring. After which, pour the entire mixture into 428 milliliters of 95% ethanol while stirring the ethanol. After which, filter-off the precipitated potassium salt of sulfamic acid, wash with 100 milliliters of 95% ethanol, several times, using the same washing portion, and then vacuum dry or air-dry the product. After the product has been sufficiently dried, grind it up into a fine powder for use in step 2.

Step 2: Preparation of potassium dinitramide

Place 90 milliliters of 90% nitric acid into a beaker, and then add 32 milliliters of 98% sulfuric acid. Thereafter, cool the acid mixture to -30 Celsius by mean of a dry ice/acetone bath. Then, carefully, and gradually add 34 grams of the potassium salt of sulfamic acid (prepared in step 1), in 1 gram portions, to the nitrating acid mixture over a period of about 40 minutes. During the addition, rapidly stir the nitrating acid mixture and maintain its temperature at -30 Celsius. After the addition (40 minutes), immediately pour the entire reaction mixture into a beaker filled with 300 grams of crushed ice and 300 milliliters of water. Immediately thereafter, place this ice water mixture into a dry ice/acetone bath, and then rapidly add 18 grams of a cold potassium hydroxide solution prepared by dissolving 18 grams

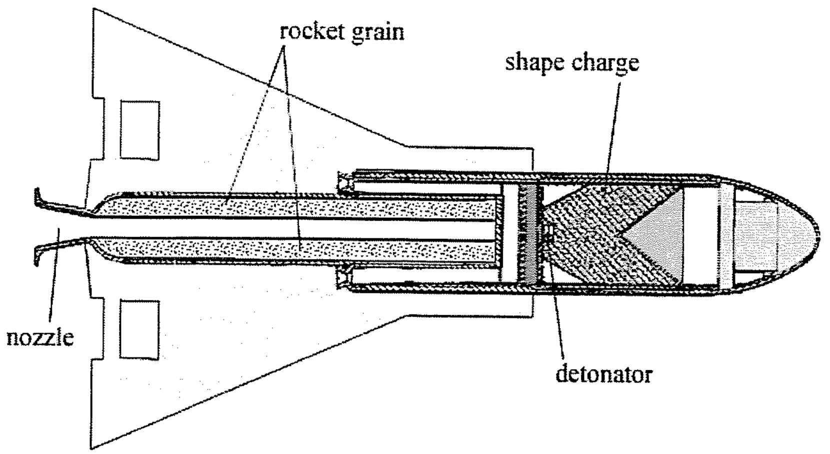
of potassium hydroxide into 40 milliliters of ice-cold water. During the potassium hydroxide addition, rapidly stir the reaction mixture while keeping its temperature below 0 Celsius. Note: the solution should turn a greenish-yellow color. After the addition of the potassium hydroxide, place the reaction mixture into a rotary evaporator, and evaporate-off the water under vacuum until dry solid remains. If rotary evaporator is unavailable, place the reaction mixture into a shallow pan, and then blow air over the surface until dry solid remains. When dry solid remains, recover the dry solid, and then mix with 20 milliliters of acetone, and then add 200 milliliters of isopropyl alcohol. Then stir the mixture rapidly for several minutes. After which, place the mixture into a clean rotary evaporator, and evaporate-off the acetone, and some of the isopropyl alcohol under vacuum. If a rotary evaporator is unavailable, place the mixture into a distillation apparatus, and carefully distill-off the acetone and some of the isopropyl alcohol. Once the acetone has been removed, stop the evaporation, and then cool the mixture to room temperature. When the acetone is removed, the KDN will precipitate. Thereafter, filter-off the precipitated KDN, and then vacuum dry or air-dry the product. The result will be about 21.4 grams of relatively pure KDN.

- High Performance Ammonium Dinitramide Propellants in this section -

1. 03-02-001A High Performance Military grade rocket propellant of ADN: *59% ADN, 24% nitrocellulose, 13% aluminum, 3.6% polyisocyante curative catalyst, 0.40% impurities*	**2. 03-02-002A: High Performance Military grade rocket propellant utilizing ADN:** *68.32% ADN, 18.63% epoxy binder, 12.42% aluminum powder, 0.62% copper chromite burn catalyst, 0.01% residual balance*
3. 03-02-003A: High Performance Military grade rocket propellant utilizing ADN: *57.14% ADN, 14.28% nitrocellulose, 12.69% aluminum powder, 10.31% epoxy binder, 5.55% urea nitrate, 0.03% balance*	**4. 03-02-004A: High Performance Military grade rocket propellant utilizing ADN:** *63.15% ADN, 12.63% aluminum powder, 9.47% nitrocellulose, 7.36% potassium nitrate, 7.36% PVC, 0.03% mixed balance*
5. 03-02-005A: High Performance castable ADN rocket propellant: *48.85% ADN, 25.44% dimethoxyethyl phthalate, 25.44% nitrocellulose, 0.25% lecithin, 0.,02% impurities*	**6. 03-02-006A: High Performance ADN rocket propellant:** *54.39% ADN, 16.73% urea nitrate, 12.55% PVC, 7.53% silicon, 7.53% hexamine, 1.25% iron-III-oxide, 0.02% balance*
7. 03-02-007A: High Performance ADN rocket propellant: *60.86% ADN, 10.43% magnesium powder, 8.69% ammonium perchlorate, 7.82% epoxy resin, 6.95% PVC, 5.21% nitrocellulose, 0.04 balance*	**8. 03-02-008A: High Performance AND/KDN rocket propellant:** *55.29% AND or KDN, 13.82% potassium nitrate, 12.9% Teflon, 9.21% aluminum powder, 6.45% boron powder, 2.3% iron-III-oxide, 0.03% mixed balance*
9. 03-02-009A: High Performance ADN rocket propellant: *49% ADN, 26% ammonium perchlorate, 14% aluminum, 4.6% triacetin, 4% plastisol nitrocellulose, 1% magnesium oxide burn catalyst, 1% 2-nitrodiphenylamine, 0.32% 2,6-toluene diisocyanate curative, 08% residue*	**10. 03-02-010A High Performance Teflon based ADN rocket propellant:** *69.3% ADN, 18.8% aluminum powder, 8.9% butyl rubber, 2.9% Teflon, 0.10% residue*
11. 03-02-011A High Performance ADN rocket propellant with boron modifier: *63.4% boron, 31.7% ADN, 2.9% glyceryl monoricinoleate, 1.77% toluene diisocyanate, 0.08% Ferric acetyl acetonate, 0.08% diethanol oleamide, 0.07% impurities*	**12. 03-02-011B High Performance ADN rocket propellant with boron modifier:** *63.4% ADN, 31.7% boron powder, 2.9% glyceryl monoricinoleate, 1.77% toluene diisocyanate, 0.08% Ferric acetyl acetonate, 0.08% diethanol oleamide, 0.07% impurities*
13. 03-02-012A High Performance ADN rocket propellant: *67.58% ammonium perchlorate, 16.48% nitrocellulose, 14.83% diglycidyl ether, 1.08% triethylene tetramine, 0.03% residual balance*	**14. 03-02-013A High performance ADN rocket propellant:** *67.9% ADN, 26.3% polybutadiene polymer, 2.1% polymer butadiene, 2% aluminum, 1.47% epoxy compound, 0.06% chromium compound catalyst, 0.17% residual balance*
15. 03-02-014A: High performance ADN rocket propellant (with metal hydride accelerator): *43.01% ADN, 26.88% ammonium nitrate, 12.54% sodium hydride, 8.96% epoxy resin, 4.2% magnesium powder, 2.5% sodium hypophosphite, 1.79% copper-II-chromite burn rate catalyst, 0.12% residual impurities*	**16. 03-02-015A: High Performance JPL X360-ADN (new) rocket propellant:** *48.03% ADN, 23.43% polypropylene glycol plasticizer, 20.58% ammonium nitrate, 4.7% toluene diisocyante, 1.96% copper chromite burn rate catalyst, 1.17% 1,2,6-hexanetriol, 0.098% ferric acetyl acetonate, 0.032% mixed residual balance*

17. 03-02-016A: High performance ADN, JATO rocket propellant: *51.04% ADN, 21.89% ammonium nitrate, 8% 2,4,-dinitrodiphenyl ether, 8% ethylene glycol diglycolate, 4.74% cellulose acetate, 3% Prussian blue pigment catalyst, 2.3% acetonylacetone dioxime, 1% carbon black, 0.03% residue*	**18. 03-02-017A: High Performance ADN rocket propellant with nitroguanidine base:** *47.24% ADN, 26.24% nitroguanidine, 20.99% triacetin, 5.24% diethyl phthalate, 0.26% lecithin, 0.03% mixed balance*
19. 03-02-018A: High Performance ADN rocket propellant: *75.52% ADN, 8.25% ammonium dichromate, 5.63% copolymer binder, 5.43% polybutadiene, 2.71% Milori blue catalyst, 2% carbon black filler, 0.40% magnesium oxide catalyst, 0.06% mixed residual balance*	**20. 03-02-019A: High Performance ADN rocket propellant:** *50% ADN, 21.42% magnesium sulfite, 14.28% nitrocellulose, 7.14% aluminum powder, 5.71% magnesium, 1.42% aluminum stearate catalyst, 0.03% balance*
21. 03-02-020A: High Performance ADN military rocket propellant: *49.7% ADN, 24% nitroguanidine, 19.9% ammonium perchlorate, 4.7% ethyl acrylate-acrylic acid copolymer, 1% UNOX 221 linking agent, 0.49% carbon black catalyst, 0.210% moisture*	

03-02-001A: High Performance Military grade rocket propellant of ADN:
Into a standard blender, utilizing a plastic blade, not sharp steel, place ***14.4 grams of a polyisocyanate curative*** called Desmodur RTM N-100, followed by ***52 grams of powdered aluminum*** of fine grain. Thereafter, turn on the blender (medium, and thoroughly blend the two ingredients for about 30 minutes at room temperature. Thereafter, simply add in ***97 grams of nitrocellulose*** of any nitrogen percentage, followed by ***236 grams of ADN***. Immediately thereafter, continue to blend the mixture on low speed for about 30 minutes. Now, after blending, the propellant is used by simply pouring it and pressing it directly into your rocket motor or mold, and then gently shaking the motor or mold to remove any air bubbles, and then allowing the rocket motor or mold to cure for several days at room temperature.
Burn rate: 0.70 inches per second at 1000 psi (average test fire's may vary).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***59% ADN, 24% nitrocellulose, 13% aluminum, 3.6% polyisocyante curative catalyst, 0.40% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Specialty military rocket fuel for a variety of rockets and missiles.

Anti-tank rocket	**Details**
	Another illustration of an anti-tank rocket.

03-02-002A: High Performance Military grade rocket propellant utilizing ADN:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place ***550 grams of ADN,*** followed by ***100 grams of aluminum powder*** of average mesh, followed by ***5 grams of copper-II-chromite***, and then followed by 150 milliliters of acetone. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow the mixture to thoroughly dry. Note: a vacuum apparatus can be used to recover the solvent if desired. Thereafter, place the mixture into any suitable ball mill, and then tumble the mixture at 75 RPM for about 3 hours. Note: use about 50 grams of aluminum shot. Thereafter, place this mixture into any suitable clean mixing bowl, equipped with motorized stirrer, and then add in ***150 grams of epon 815***, or any other liquid based epoxy resin, and then blend the mixture in the absence of air for about 30 minutes. Thereafter, the mixture is ready to use. To use, the mixture simply needs to be pressed and vibrated into any desired rocket motor, engine, ect., and then cure the munitions in an oven at moderate temperature until the mixture is dry and hard. A standard igniter composition can be used in the typical manner.
Burn rate: Unknown—probably 0.5 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): N/A
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***68.32% ADN, 18.63% epoxy binder, 12.42% aluminum powder, 0.62% copper chromite burn catalyst, 0.01% residual balance***
Classification: Deflagrating explosive (classified as propellant)
Use: Specialty rocket propellant for various operations.

03-02-003A: High Performance Military grade rocket propellant utilizing ADN:
Into a suitable mixing bowl, equipped with motorized stir in the usual means, place ***360 grams of ADN,*** followed by ***80 grams of aluminum powder*** of average mesh, followed by ***35 grams of urea nitrate***, followed by ***90 grams of nitrocellulose***, and then followed ***65 grams of epon 815***, or any other liquid based epoxy resin, and then blend the mixture in the absence of air for about 30 minutes. Thereafter, the mixture is ready to use. To use, the mixture simply needs to be pressed and vibrated into any desired rocket motor, engine, ect., and then cure the munitions in an oven at moderate temperature until the mixture is dry and hard. A standard igniter composition can be used in the typical manner.
Burn rate: 0.34 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7+
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***57.14% ADN, 14.28% nitrocellulose, 12.69% aluminum powder, 10.31% epoxy binder, 5.55% urea nitrate, 0.03% balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Specialty rocket propellant for various operations.
Note: KDN can be used in place of the ADN if desired.

03-02-004A: High Performance Military grade rocket propellant utilizing ADN:
Into a suitable mixing bowl, equipped with motorized stir in the usual means, place ***600 grams of ADN,*** followed by ***70 grams of potassium nitrate***, followed by ***120 grams of aluminum powder***, followed by ***90 grams of nitrocellulose***, and then followed ***70 grams of finely ground PVC***, and then add in 450 milliliters of tetrahydrofuran, and then blend the mixture about 30 minutes. Thereafter, add in 450 milliliters of cold water, and then continue to blend the mixture for about 40 minutes. Thereafter, filter-off the insoluble mass, and then press and vibrate the filtered-off mass into any desired rocket motor, engine, ect., and then cure the munitions in an oven at moderate temperature until the mixture is dry and hard. A standard igniter composition can be used in the typical manner.
Burn rate: 0.45 to 0.48 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7+
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***63.15% ADN, 12.63% aluminum powder, 9.47% nitrocellulose, 7.36% potassium nitrate, 7.36% PVC, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Specialty rocket propellant for various operations.
Note: KDN can be used in place of the ADN if desired.

03-02-005A: High Performance castable ADN rocket propellant:
This process is very similar to the ammonium nitrate process. Into a suitable mixing bowl, equipped with motorized stirrer, place ***500 grams of dimethoxyethyl phthalate***, followed by ***500 grams of nitrocellulose (average nitrogen content)***, and then followed by ***5 grams of lecithin***. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a nice slurry. Thereafter, add in ***960 grams of ADN***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture into a vacuum

apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 70 Celsius for about 2 days. A standard ignition composition can be used for proper burn.
Burn rate: 0.15 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***48.85% ADN, 25.44% dimethoxyethyl phthalate, 25.44% nitrocellulose, 0.25% lecithin, 0.,02% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-02-006A: High Performance ADN rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***650 grams of ADN***, followed by ***150 grams of fine grained PVC***, and then followed by ***90 grams of finely divided silicon***. Thereafter, add in 250 milliliters of hexane, and then blend the mixture on moderate speed for about 15 minutes to form a pasty mass. Thereafter, add in ***200 grams of urea nitrate***, followed by ***15 grams of iron-III-oxide***, and then followed by ***90 grams of hexamine***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at moderate temperature in the usual means. A standard ignition composition can be used for proper burn.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A (most likely 9)
Ease of ignition (1 to 10): N/A
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***54.39% ADN, 16.73% urea nitrate, 12.55% PVC, 7.53% silicon, 7.53% hexamine, 1.25% iron-III-oxide, 0.02% balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.
Note: KDN can be used in place of the ADN if desired.

03-02-007A: High Performance ADN rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***700 grams of ADN***, followed by ***100 grams of ammonium perchlorate***, followed by ***120 grams of magnesium powder*** (note: coat the magnesium powder with linseed oil in a ball mill before adding), followed by ***60 grams of nitrocellulose***, followed by ***80 grams of fine grained PVC***, and then followed by ***90 grams of any desired epoxy liquid resin***. Thereafter, blend the mixture on moderate speed for about 45 minutes in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at moderate temperature in the usual means. A standard ignition composition can be used for proper burn.
Burn rate: 0.34 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***60.86% ADN, 10.43% magnesium powder, 8.69% ammonium perchlorate, 7.82% epoxy resin, 6.95% PVC, 5.21% nitrocellulose, 0.04 balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-02-008A: High Performance AND/KDN rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***600 grams of AND or KDN***, followed by ***140 grams of finely powdered Teflon***, and then followed by ***70 grams of finely divided boron powder***. Thereafter, add in 250 milliliters of hexane, and then blend the mixture on moderate speed for about 15 minutes to form a pasty mass. Thereafter, add in ***150 grams of potassium nitrate***, followed by ***25 grams of red iron-III-oxide***, and then followed by ***100 grams of aluminum powder***, and then blend the

mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at moderate temperature in the usual means. A standard ignition composition can be used for proper burn.
Burn rate: 0.30 inches per second at 1500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***55.29% AND or KDN, 13.82% potassium nitrate, 12.9% Teflon, 9.21% aluminum powder, 6.45% boron powder, 2.3% iron-III-oxide, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-02-009A: High Performance ADN rocket propellant:
Into a suitable mixing bowl, mixer, blender, or similar container, place ***23 grams of triacetin***, followed by ***70 grams of finely divided aluminum powder***, followed by ***5 grams of finely divided magnesium oxide***, followed by ***5 grams of 2-nitrodiphenylamine***, followed by ***20 grams of plastisol nitrocellulose***, followed by ***245 grams of ADN***, and then blend the mixture on low speed at room temperature for about 10 minutes. After 10 minutes, slowly add in ***130 grams of ammonium nitrate***, followed by ***1.6 grams of 2,6-toluene diisocyanate***, and then continue to blend the mixture on low speed for about 10 to 15 minutes to form a uniform mixture. Thereafter, the mixture is ready to be used. To use, the propellant needs to be pressed into any desirable rocket motor, engine, ect., under mild pressure, and then allowed to cure at room temperature for about several days. Note: heat may or may not be used to speed up the curing process, and caution should be taken. Requires proper ignition composition.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***49% ADN, 26% ammonium perchlorate, 14% aluminum, 4.6% triacetin, 4% plastisol nitrocellulose, 1% magnesium oxide burn catalyst, 1% 2-nitrodiphenylamine, 0.32% 2,6-toluene diisocyanate curative, 08% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets for military and commercial use.
Note: KDN can be used in place of the ADN if desired.

03-02-010A: High Performance Teflon based ADN rocket propellant:
Into a suitable mixing drum, bowl, blender, ect., equipped with motorized stirrer, place ***45 grams of standard butyl rubber***, followed by ***15 grams of finely divided Teflon powder***, followed by ***95 grams of finely divided aluminum powder of standard mesh***, followed by ***350 ADN***, and then followed by 150 milliliters of acetone, and then blend the mixture at room temperature until the bulk of the acetone evaporates. Thereafter, add in 250 milliliters of cold water, and then continue to blend the mixture for about 10 to 15 minutes on moderate speed. After 10 to 15 minutes, stop the stirring process, and then allow the mixture to stand at room temperature for an hour or so. During which time, the propellant mixture will settle to the bottom of the mixing container. Thereafter, filter-off the insoluble propellant mixture, and then dry it in a desiccator filled with metallic sodium. Once the filtered-off propellant composition has been collected and thoroughly dried, it is ready for pressing. To do so, the dried propellant should be pressed into any desirable rocket motor, engine, mold, ect., under a typical pressure of 3000 or greater psi.
Burn rate: Not calculated.
Burning rate pressure slope: 0.49
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can detonate, but only severe conditions.
Percentage: ***69.3% ADN, 18.8% aluminum powder, 8.9% butyl rubber, 2.9% Teflon, 0.10% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for various applications.
Note: KDN can be used in place of the ADN if desired.

03-02-011A: High Performance ADN rocket propellant with boron modifier:
Into a suitable beaker, or similar mixing container, equipped with motorized stirrer in the usual means, place ***27.6 grams of glyceryl monoricinoleate (GMRO)***, followed by ***766 milligrams of diethanol oleamide (DEO)***, followed by ***16.8 grams of toluene diisocyanate (TDI)***, followed by 700 milliliters of acetone. Thereafter, blend the mixture for about 5 minutes at room temperature. Thereafter, add in ***600 grams of finely powdered boron***, followed by ***300 grams of ADN***, and then followed by ***766 milligrams of ferric acetyl acetonate***, and then continue to blend the mixture for about 30 to 40 minutes to form a homogenous mixture where no solid material settles out after stirring has stopped. Thereafter, pour and vibrate the fluidized mass into any desirable rocket motor, engine, ect., under the usual means, and then cure the devices in an oven at 60 Celsius until the acetone has evaporated and the rocket propellant has hardened—time may vary.
Burn rate: 0.15 inches per second at 500 psi and 50 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: None.
Percentage: ***63.4% boron, 31.7% ADN, 2.9% glyceryl monoricinoleate, 1.77% toluene diisocyanate, 0.08% Ferric acetyl acetonate, 0.08% diethanol oleamide, 0.07% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in medium velocity rocket motors.
Note: KDN can be used in place of the ADN if desired.

03-02-011B: High Performance ADN rocket propellant with boron modifier:
Into a suitable beaker, or similar mixing container, equipped with motorized stirrer in the usual means, place ***27.6 grams of glyceryl monoricinoleate (GMRO)***, followed by ***766 milligrams of diethanol oleamide (DEO)***, followed ***by 16.8 grams of toluene diisocyanate (TDI)***, followed by 700 milliliters of acetone. Thereafter, blend the mixture for about 5 minutes at room temperature. Thereafter, add in ***600 grams of ADN***, followed by ***300 grams of finely ground boron powder***, and then followed by ***766 milligrams of ferric acetyl acetonate***, and then continue to blend the mixture for about 30 to 40 minutes to form a homogenous mixture where no solid material settles out after stirring has stopped. Thereafter, pour and vibrate the fluidized mass into any desirable rocket motor, engine, ect., under the usual means, and then cure the devices in an oven at 60 Celsius until the acetone has evaporated and the rocket propellant has hardened—time may vary.
Burn rate: Not calculated.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: None.
Percentage: ***63.4% ADN, 31.7% boron powder, 2.9% glyceryl monoricinoleate, 1.77% toluene diisocyanate, 0.08% Ferric acetyl acetonate, 0.08% diethanol oleamide, 0.07% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in medium velocity rocket motors.

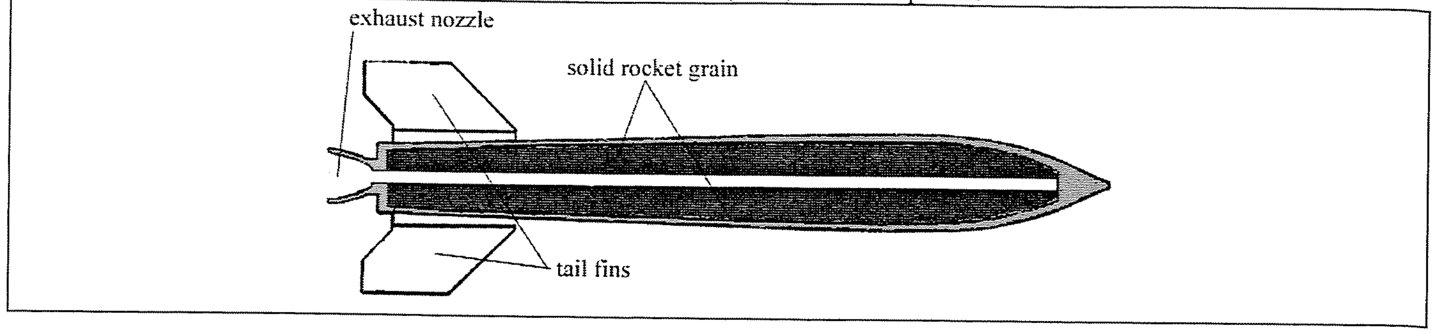
03-02-012A: High Performance ADN rocket propellant:
Into a suitable mixing container, blender, or similar device, equipped with motorized stirrer, place ***180 grams of diglycidyl ether***, followed by 360 milliliters of methylene chloride, and then blend the mixture for about 10 minutes to dissolve the diglycidyl ether. Thereafter, add in ***820 grams of ADN***, followed by ***200 grams of nitrocellulose***, followed by ***13.2 grams of triethylene tetramine***, and then continue to blend the mixture for about 60 to 70 minutes at room temperature. Thereafter, the mixture should be a tacky mass. Thereafter, the mixture is ready for use. To use, the tacky brittle mass needs to be pressed into any desirable rocket motor, engine, mold, ect, under a pressure of 1800 to 2400 psi. Thereafter, the munitions need to be placed into a vacuum, and a vacuum of 400 milliliters of mercury applied to evacuate air. Thereafter, the munitions need to be cured in an oven at 100 Celsius for about 4 hours. The cured propellant can be ignited using any standard means.
Burn rate: Not calculated, but similar to ammonium perchlorate propellants.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Moderate, only under severe conditions.

Percentage: ***67.58% ammonium perchlorate, 16.48% nitrocellulose, 14.83% diglycidyl ether, 1.08% triethylene tetramine, 0.03% residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets and missiles for multiple uses.
Note: KDN can be used in place of the ADN if desired.

03-02-013A: High performance ADN rocket propellant:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place ***750 milligrams of chromium 2-ethylhexanoate***, followed by ***322 grams of a carboxy terminated polybutadiene*** with a molecular weight of 5,000 and a specific gravity of 0.91 at 60 degrees Fahrenheit containing 1.0 to 1.5 percent 2,2'-methylene-bis(4-methyl-6-tertbutyl) phenol as antioxidant, followed by ***18 grams of 3,4-epoxycyclohexylmethyl carboxyl-3,4-epoxycyclohexane*** (with an epoxy equivalent of 130.6 and 96% pure) and the N,N-ortho-tris(epoxypropyl) p-aminophenol, followed by ***26.5 grams of a polymer of butadiene*** (containing a small amount of phenyl-beta-naphthylamine as stabilizer), thereafter followed by ***830 grams of ADN*** of average mesh, and then followed by ***25 grams of aluminum powder*** of average mesh. Thereafter, blend the mixture for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor or engine in the usual fashion. Thereafter, the munitions should be cured at room temperature for about 6 days.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on rate of combustion).
Ease of ignition (1 to 10): 6+ (based on standard ignition).
Tendency to cake: None
Explosive ability: Possible.
Percentage: ***67.9% ADN, 26.3% polybutadiene polymer, 2.1% polymer butadiene, 2% aluminum, 1.47% epoxy compound, 0.06% chromium compound catalyst, 0.17% residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual purposes.
Note: KDN can be used in place of the ADN if desired.

03-02-014A: High performance ADN rocket propellant (with metal hydride accelerator):
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of the usual diameter, place ***1200 grams of ADN***, followed by ***120 grams of magnesium powder***, followed by ***50 grams of copper-II-chromite***, and then followed by ***70 grams of sodium hypophosphite***. Thereafter, tumble the mixture at 150 RPM for about 2 hours in the absence of moisture. Thereafter, place this mixture into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner. Note: separate the tumbled mixture from the steel shot using a typical screen in the usual manner. Now, into the mixing bowl, place 500 milliliters of acetone, and then add in ***750 grams of ammonium nitrate,*** followed by ***350 grams of sodium hydride***, and then blend the mixture on moderate speed to form a rough paste. Thereafter, place the mixture into a vacuum apparatus, and remove the solvent using a vacuum. Thereafter, place the dried mass into a suitable ball mill, filled with 500 grams of Teflon coated heavy steel shot, and then tumble the mixture for about 2 hours in the absence of air to form a uniform powder. Thereafter, place this pulverized mass into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***250 grams of Epon 815 epoxy resin***, or any other desired liquid epoxy compound, and then blend the entire mixture in the absence of air for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press and vibrate the mixture into any desired rocket engine, mold, ect., in the usual manner. Thereafter, allow the motors to cure at room temperature or in an oven at ordinary temperatures in the usual manner. Use typical ignition composition.
Burn rate: 0.20 inches per second at 500 psi
Water resistance: Good.
Stability: Typical.
Flammability (1 to 10): 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Moderate—only under severe conditions.
Percentage: ***43.01% ADN, 26.88% ammonium nitrate, 12.54% sodium hydride, 8.96% epoxy resin, 4.2% magnesium powder, 2.5% sodium hypophosphite, 1.79% copper-II-chromite burn rate catalyst, 0.12% residual impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: For rockets and missiles for the usual propulsion needs.
Note: The sodium hypophosphite can be replaced with any suitable reducing agent.
Note: KDN can be used in place of the ADN if desired.

High Performance Model Rocket



03-02-015A: High Performance JPL X360-ADN (new) rocket propellant:
Into a suitable horizontal ball mill, filled with Teflon coated steel shot of the usual diameter and size, place ***105 grams of ground ammonium nitrate***, followed by ***245 grams of ADN***, followed by ***10 grams of copper chromite***, and then tumble the mixture for about 30 minutes at 150 RPM to form a uniform mixture. Afterwards, into a suitable mixing container, equipped with vacuum gauge, motorized stirrer, and heating source, place the dry tumbled mixture previously prepared, followed by ***119.5 grams of polypropylene glycol 2025***, and then blend the mixture on moderate speed for about 30 minutes under a vacuum of 10 millimeters of mercury at a temperature of 21 Celsius. Thereafter, prepare a curing mixture by adding and mixing with, ***500 milligrams of ferric acetyl acetonate*** to ***24 grams of toluene diisocyante,*** and then quickly remove the vacuum, open the mixing container, and then throw in curing mixture, and then reseal the container, apply a vacuum of 10 millimeters of mercury, and then continue to blend the mixture on moderate speed for about 10 minutes at 21 Celsius. Thereafter, open the container once again, and quickly add in ***6 grams of 1,2,6-hexanetriol***, and then re-seal the container, apply the same vacuum as before, and then continue to blend the mixture on moderate speed for about 10 additional minutes. Thereafter, the propellant mixture is ready to be casted. To do so, simply pour it into any desirable rocket motor, engine, mold, ect., and then briefly vibrate the munitions to remove air bubbles, and then cure the munition(s) in an oven at 60 Celsius for about 16 hours. Requires standard rocket propellant ignition compositions.
Burn rate: 0.30 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***48.03% ADN, 23.43% polypropylene glycol plasticizer, 20.58% ammonium nitrate, 4.7% toluene diisocyante, 1.96% copper chromite burn rate catalyst, 1.17% 1,2,6-hexanetriol, 0.098% ferric acetyl acetonate, 0.032% mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and propellants for multiple uses.
Note: KDN can be used in place of the ADN if desired.

03-02-016A: High performance ADN, JATO rocket propellant:
Into a suitable beaker or similar container, equipped with motorized stirrer of the usual means, place ***40 grams of 2,4,-dinitrodiphenyl ether,*** followed by ***40 grams of ethylene glycol diglycolate***, and then heat the mixture to 140 Celsius, and then blend the mixture at this temperature for about 10 to 15 minutes to form a homogenous mixture. Thereafter add in ***23.7 grams of cellulose acetate***, in small portions at a time, while thoroughly blending the mixture After the addition of all the cellulose acetate, lower the temperature to 120 Celsius, and when this new temperature is achieved, add in ***11.5 grams acetonylacetone dioxime***, and then continue to blend the mixture for about 10 to 15 minute at 120 Celsius. Thereafter, add in ***255 grams of ADN***, and then continue to blend the mixture at 120 Celsius for about 5 to 10 minutes on high speed. Now, into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***109.4 grams of ammonium nitrate*** of 325 mesh, followed by ***5 grams of finely divided carbon black***, and then followed by ***15 grams of Prussian blue pigment catalyst***, and then tumble the mixture for about 30 minutes at 500 RPM. After this 30-minute tumbling operation, add this tumbled mixture to the heated mixture in the beaker or similar container, and then continue to blend the mixture at 120 Celsius for about 30 minutes to form a uniform well-mixed mixture. Note: the last 15 minutes of the mixing period should be conducted under a vacuum of 15 millimeters of mercury for best results (degassing). Afterwards, the mixture is ready for use. To use, the mixture simply needs to be poured and vibrated into any desirable rocket motor, engine, mold, ect., and then allowed to cure at room temperature for several days or more.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on combustion exponent)
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Very low.

Percentage: ***51.04% ADN, 21.89% ammonium nitrate, 8% 2,4,-dinitrodiphenyl ether, 8% ethylene glycol diglycolate, 4.74% cellulose acetate, 3% Prussian blue pigment catalyst, 2.3% acetonylacetone dioxime, 1% carbon black, 0.03% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in JATO rocket assisted munitions.
Note: KDN can be used in place of the ADN if desired.

03-02-017A: High Performance ADN rocket propellant with nitroguanidine base:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***200 grams of triacetin***, followed by ***50 grams of diethyl phthalate***, followed by ***250 grams of nitroguanidine***, and then followed by ***2.5 grams of lecithin***. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a uniform mass. Thereafter, add in ***450 grams of ADN***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 70 Celsius for about 2 days. A standard ignition composition can be used for proper burn.
Burn rate: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***47.24% ADN, 26.24% nitroguanidine, 20.99% triacetin, 5.24% diethyl phthalate, 0.26% lecithin, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.
Note: KDN can be used in place of the ADN if desired.

03-02-018A: High Performance ADN rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***375 grams of ADN***, followed by ***13.5 grams of Milori blue pigment agent***, followed by ***2 grams of magnesium oxide (light)***, followed by ***10 grams of carbon black***, followed by ***41 grams of ammonium dichromate***, followed by ***27 grams of polybutadiene***, and then followed by ***28 grams of any desired epoxy resin or copolymer binder***. Thereafter, blend the mixture on moderate speed for about 45 minutes at room temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 90 Celsius for about 6 to 8 days. A standard ignition composition can be used for proper burn.
Burn rate: May vary.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 6
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***75.52% ADN, 8.25% ammonium dichromate, 5.63% copolymer binder, 5.43% polybutadiene, 2.71% Milori blue catalyst, 2% carbon black filler, 0.40% magnesium oxide catalyst, 0.06% mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.
Note: KDN can be used in place of the ADN if desired.

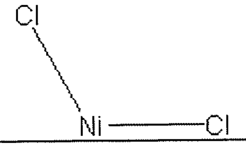
03-02-019A: High Performance ADN rocket propellant:
Into a suitable ball mill or vertical mixer, place ***700 grams of ADN***, followed by ***300 grams of magnesium sulfite***, followed by ***200 grams of nitrocellulose,*** followed by ***20 grams of aluminum stearate,*** followed by ***100 grams of aluminum powder***, and then followed by ***80 grams of magnesium powder***. Thereafter, add in 300 grams of Teflon coated steel shot, and then tumble or rotate the mixture at 200 RPM for about 1 hour. Note: during this one hour tumbling period, spray in 100 milliliters of hexane, in small portions at a time, during the 1 hour period. Thereafter, separate the mixture from the steel shot using the desired screen method. Thereafter, the mixture is reedy for use. To use, the mixture simply needs to be pressed into any desirable rocket motor, mold, engine, ect., under high pressure in the usual means.
Burn rate: Not calculated—may vary.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7

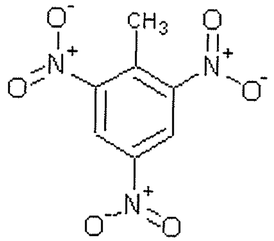
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***50% ADN, 21.42% magnesium sulfite, 14.28% nitrocellulose, 7.14% aluminum powder, 5.71% magnesium, 1.42% aluminum stearate catalyst, 0.03% balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual means.
Note: KDN can be used in place of the ADN if desired.

03-02-020A: High Performance ADN military rocket propellant:
Into a standard mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place ***24 grams of ethyl acrylate-acrylic acid (95-5, copolymer binder),*** followed by ***5.2 grams of "UNOX 221" (cross linking agent),*** and then blend the mixture on high for about 30 minutes at room temperature. After 30 minutes, add in ***2.5 grams of carbon black***, followed by ***252.5 grams of ADN***, and then continue to thoroughly blend the mixture on high at room temperature for 30 minutes. After 30 minutes, add in ***101 grams of ammonium perchlorate*** and then continue to blend the mixture for about 30 minutes at room temperature. Once again, after 30 minutes, carefully add in ***122 grams of nitroguanidine***, and then continue to blend, but reduce speed to slow, and then gently continue blending for about 10 to 15 minutes at room temperature. Afterwards, the propellant is ready to be casted. To do so, it should be gently pressed into any desirable rocket motor, engine, mold, ect., using the usual techniques, and the resulting rocket motor or mold should then be cured for several days. Note: during the pressing, the rocket motor or mold should be vibrated to work out any air bubbles or pockets.
Burn rate: N/A
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***49.7% ADN, 24% nitroguanidine, 19.9% ammonium perchlorate, 4.7% ethyl acrylate-acrylic acid copolymer, 1% UNOX 221 linking agent, 0.49% carbon black catalyst, 0.210% moisture***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel heavy munitions.
Note: KDN can be used in place of the ADN if desired.

Section 3: Ammonium Nitrate Containing

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)		**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)		**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)		**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)		**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)		**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)		**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)		**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)		**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)		**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)		**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)		**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)		**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)		**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)		**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)		**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)		**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)		**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)		**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)		**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)		**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)		**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)		**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)		**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)		**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)		**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)		**52. Nickel Chloride**
		
		Nickel chloride forms beautiful greenish crystals or golden-yellow white granules or powder. The solid is readily prepared by dissolving nickel metal into hot dilute hydrochloric acid, followed by recrystallization.
53. TNT		



TNT is a white, slightly yellow, or yellowish crystalline solid with a melting point of 80 Celsius. It is insoluble in water, but soluble in acetone, and benzene. It is widely used in the explosives field either by itself, or alloyed with other explosives such as RDX, HMX, or almost any meltable explosive. TNT is also commonly used when mixed with ammonium nitrate for use in military dynamites. TNT is one of the highest volume produced high explosive in the world, and during WWII, so much TNT was made that its preparation was ranked higher by volume then aspirin (180,000+ tones per year). TNT is widely used in grenades, bombs, missiles, demolition charges, and almost every sort of explosive munition imaginable.

Method of Prerparation 1:

Method of Preapration 4:

Method of Preparation 2:

Method of Preparation 3:

Method of Preparation 5:

reaction mixture for 20 minutes. After which, filter the entire reaction mixture to collect any precipitated TNT, and then decant the upper methylene chloride layer. Then place this methylene chloride layer into a distillation apparatus and distill-off the methylene chloride at 40 Celsius until dry solid remains. When dry solid remains, remove the heat source and allow the flask to cool to room temperature. Afterwards, collect the dry TNT product from the flask and then place onto the filter used earlier. Then wash all the collected TNT product with 1000 milliliters of water. After washing, vacuum dry or air-dry the TNT product. Then place 1600 grams of 70% sulfuric acid into a beaker, and then add the dry TNT product. Then stir the mixture to form a slurry. Continue to stir the slurry for 2 hours at room temperature, and then filter-off the TNT product. Finally, wash the TNT with 6000 milliliters of a 5% sodium bicarbonate solution, followed by 4000 milliliters of cold water, and then vacuum dry or air-dry the TNT product.

- High Performance Ammonium Nitrate Propellants in this section -

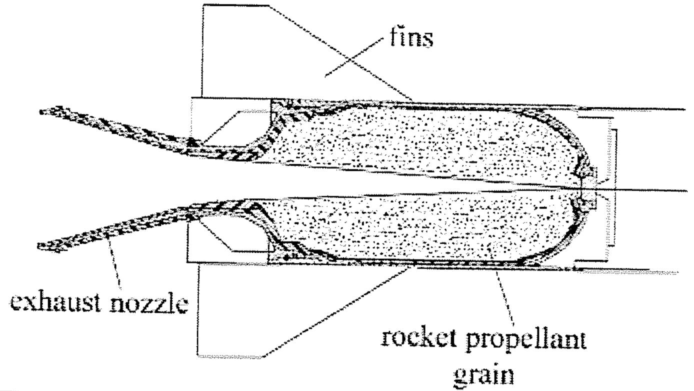
1. 03-03-001A High Performance military rocket propellant (JPL X350 type): *77.8% ammonium nitrate, 11% dioctyl azelate, 6.6% hexane triol plasticizer, 1.6% 2,4-toluene diisocyanate, 1.5% poly propylene glycol plasticizer, 1.1% copper chromite burn rate accelerator, 0.05% ferric acetylacetonate curing catalyst, 0.35% impurities*	**2. 03-03-002A: Nitrate based military rocket propellant (smokeless):** *66.9% ammonium nitrate, 25% nitrocellulose, 8% cornstarch, 0.10% residue*
3. 03-03-003A: Ammonium nitrate based military rocket propellant with ADN increased power addictive: *64% Ammonium nitrate, 15.8% thermoplastic phenoxy resin, 11.9% ADN, 3% carbon black filler, 2.2% acetyl triethylcitrate catalyst, 2% sodium barbiturate stabilizer, 1% 2,4-toluene diamine addictive, 0.10% residue*	**4. 03-03-003B: Ammonium nitrate based military rocket propellant with TNT power addictive:** *70% Ammonium nitrate, 13.3% thermoplastic phenoxy resin, 6.6% acetyl triethylcitrate catalyst, 4% TNT, 3% carbon black filler, 1.5% sodium barbiturate stabilizer, 0.8% 2,4-toluene diamine addictive, 0.4% ammonium oxalate burn rate catalyst, 0.2% N-phenylmorpholine inert filler, 0.20% residue*
5. 03-03-004A: Inexpensive ammonium nitrate high performance rocket propellant: *54.9% ammonium nitrate, 29.9% magnesium, 11.8% PPG polymer binder, 1.9% dioctyl adipate plasticizer, 1% isophorone diisocyante curative agent, 0.491% mixed residues, 0.009% dibutyltin diacetate curing catalyst*	**6. 03-03-05A High Performance JPL X360 rocket propellant:** *68.6% ammonium nitrate, 23.4% polypropylene glycol 2025 plasticizer, 4.7% toluene diisocyante, 1.9% copper chromite burn rate catalyst, 1.1% 1,2,6-hexanetriol, 0.21% mixed impurities, 0.09% ferric acetyl acetonate*
7. 03-03-06A High Performance polymer rocket propellant: *79.9% ammonium nitrate, 10.8% butadiene copolymer binder, 2.3% carbon black filler, 2.1% dibutoxyethoxyethyl formal plasticizer, 1.97% naphthenic acid catalyst, 1.9% Milori blue pigment burn rate catalsyt, 0.47% magnesium oxide filler, 0.31% binder catalyst, 0.25% wetting agent*	**8. 03-03-06A High Performance ammonium nitrate rocket propellant:** *83.2% ammonium nitrate, 9.1% polybutadiene polymer binder, 2% milori blue pigment curing agent, 1% 2-methyl-5-vinylpyridine copolymers, 1% carbon black catalyst filler, 0.81% benzophenone burn rate catalyst, 0.81% Pentary A copolymer catalyst, 0.74% epichlorohydrin polymerization catalyst, 0.30% zinc oxide filler, 0.30% flexamine binder addictive, 0.24% Butyl-eight rubber accelerator, 0.23% mixed residues, 0.17% sulfur burn modifier, 0.1% Aersol OT catalyst,*
9. 03-03-07B High Performance polymer ammonium nitrate rocket propellant (modified): *78.7% ammonium nitrate, 9.7% polybutadiene polymer, 3.9% ammonium dichromate, 2.3% carbon black, 2.1% ZP-211 polyether binder, 1% 2-methyl-5-vinylpyridine, 0.97% nickel chloride curing catalyst, 0.45% mixed residues, 0.35% magnesium oxide filler, 0.32% flexamine, 0.21% milori blue pigment*	**10. 03-03-08A High Performance smokeless rubber-like rocket propellant:** *78.9% ammonium nitrate, 13.7% circosol oil, 4.1% rubber binder, 0.83% carbon black, 0.75% diphenyl guanidine, 0.5% Captax accelerator, 0.28% mixed residue,0.25% tetramethyl thiua disulfide accelerator, 0.25% sulfur burn modifier, 0.20% RPA No. 3, 0.20% zinc oxide, 0.04% stearic acid catalyst*
11. 03-03-09A High Performance smokeless polymer rocket propellant: *81.8% ammonium nitrate, 10.8% Butadiene copolymer, 2.1% dibutoxyethyoxyethyl formal plasticizer, 2.1% carbon black filler, 1.9% milori blue burning catalyst, 0.38% mixed residues, 0.32% zinc oxide catalyst, 0.32% flexamine*	**12. 03-03-010A High Performance smokeless polymer rocket propellant:** *75.4% ammonium nitrate, 8.2% ammonium dichromate, 5.6% butadiene coplymer, 5.4% polybutadiene plasticizer, 2.7% milori blue burn catalyst, 2.1% philblack E furnace black, 0.42% magnesium oxide, 0.18% mixed residues*

antioxidant agent, 0.10% aerosol-OT wetting agent, 0.10% SA-113 vulcanization accelerator, 0.08% sulfur	
13. 03-03-010A High Performance smokeless polymer rocket propellant: *80.8% ammonium nitrate, 12.4% 1,3-butadiene copolymer, 2.7% carbon black, 1.9% milori burn rate catalyst, 1.3% 2-methyl-5-vinylpyridine, 0.53% formal plasticizer, 0.30% mixed residues, 0.07% zinc oxide curing catalyst*	**14. 03-03-011A High Performance rocket propellant:** *68.7% ammonium nitrate, 11.7% dinitrotoluene plasticizer, 7.8% PVC binder, 3.9% Prussian blue burn rate catalyst, 3.9% carbon black filler, 3.9% surfactant, 0.10% mixed residues*
15. 03-03-011B High Performance rocket propellant (modified): *76% ammonium nitrate, 7.8% dinitrotoluene plasticizer, 7.8% 2,4-dintrodiphenyl ether plasticizer, 5.2% PVC binder, 2% ammonium dichromate catalyst, 1% Prussian blue burn rate catalyst, 0.20% mixed residues*	**16. 03-03-012A: A high performance JATO (jet assisted take-off) rocket propellant:** *72.9% ammonium nitrate, 8% 2,4,-dinitrodiphenyl ether, 8% ethylene glycol diglycolate, 4.7% cellulose acetate, 3% Prussian blue pigment catalyst, 2.3% acetonylacetone dioxime, 1% carbon black, 0.10% residue*
17. 03-03-013A High Performance ammonium nitrate “plastic-like” propellant: *70% ammonium nitrate, 15% aluminum, 15% aluminum stearate*	**18. 03-03-014A High Performance ammonium nitrate propellant:** *80.34% ammonium nitrate, 8.54% ammonium dichromate, 6.83% binder, 4.27% ferrous ferrocyanide burn catalyst, 0.02% balance* **Percentage 2 (binder—of total composition):** *2.28% rubbery polymer, 2.28% plasticizer, 1.14% reinforcing agent, 0.56% quaternizing agent, 0.23% wetting agent, 0.12% vulcanization accelerator, 0.12% metal oxide, 0.06% antioxidant, 0.04% sulfur*
19. 03-03-015A High Performance ammonium nitrate rocket propellant utilizing asphalt: *76.81% ammonium nitrate, 22.94% N,N-dimethyl acrylamide, 025% methyl amyl ketone peroxide curing catalyst*	**20. 03-03-016A High Performance ammonium nitrate rocket propellant utilizing ammonium dichromate burn rate catalyst:** *73.58% ammonium nitrate, 12.41% methyl acrylate, 4.37% adipic acid, 4.24% diethylene glycol, 2.68% styrene, 2% ammonium dichromate, 0.396% benzoyl peroxide, 0.17% maleic anhydride, 0.099% lecithin, 0.065% balance*
21. 03-03-016B High Performance ammonium nitrate rocket propellant utilizing ammonium dichromate burn rate catalyst: *76% ammonium nitrate, 12.4% methyl acrylate, 2.8% diethylene glycol, 2.8% styrene, 2.8% adipic acid, 2% ammonium dichromate, 0.4% lecithin, 0.4% methyl ethyl ketone peroxide, 0.2%, 0.1% cobalt octoate, 0.1% balance*	**22. 03-03-017A Specialty ammonium nitrate semi-solid (gelled) rocket propellant (with increase moldability):** *71.25% ammonium nitrate, 22.35% unleaded gasoline, 3.75% carbon black, 2.65% aluminum naphthenate*
23. 03-03-018A Specialty ammonium nitrate rocket propellant with moderate acceleration for use in spacecraft: *50.89% ammonium nitrate, 21.55% hydroxyl terminated polypropylene oxide copolymer, 14.97% aluminum metal fuel, 5.98% 2,6-tolyl-diisocyante curing compound, 2.99% 1-decanol addictive, 2.99% trimethylol propane antioxidant, 0.59% ferric acetyl acetonate curing catalyst, 0.04% impurities*	**24. 03-03-019A: High Performance ammonium nitrate rocket propellant with nitrocellulose base:** *47.24% ammonium nitrate, 26.24% nitrocellulose, 20.99% triacetin, 5.24% diethyl phthalate, 0.26% lecithin, 0.03% mixed balance*
25. 03-03-019B: High Performance ammonium nitrate rocket propellant with nitrocellulose base: *48.85% ammonium nitrate, 25.44% dimethoxyethyl phthalate, 25.44% nitrocellulose, 0.25% lecithin, 0.,02% impurities*	**26. 03-03-020A: High Performance ammonium nitrate rocket propellant:** *62.18% ammonium nitrate, 11.83% acetyl triethyl citrate binder, 10.49% cellulose acetate binder, 10.44% dinitrophenoxyethanol, 3.04% carbon black filler, 0.99% disodium barbiturate catalyst, 0.99% toluene diamine cure catalyst, 0.04% mixed balance*
27. 03-03-021A: High Performance ammonium nitrate rocket propellant: *75.52% ammonium nitrate, 8.25% ammonium dichromate, 5.63% copolymer binder, 5.43% polybutadiene, 2.71% Milori blue catalyst, 2% carbon black filler, 0.40% magnesium oxide catalyst, 0.06% mixed residual balance*	**28. 03-03-022A: High Performance ammonium nitrate rocket propellant with ferric nitrate burn accelerator:** *77.27% ammonium nitrate, 18.18% polybutadiene, 4.54% ferric nitrate monohydrate, 0.01% mixed balance*
29. 03-03-023A: High Performance ammonium nitrate rocket propellant: *51.85% ammonium nitrate, 25.92% magnesium bicarbonate, 14.81% nitrocellulose, 7.4% aluminum powder, 0.02% balance*	**30. 03-03-024A: Specialty high Performance ammonium nitrate rocket propellant:** *78.88% ammonium nitrate, 12.36% ammonium tricatechol chromate, 8.76% potassium nitrate*
31. 03-03-024B: Specialty high Performance ammonium nitrate rocket propellant: *80% ammonium nitrate, 10.86% pyridine tricatechol chromate, 8.2% potassium nitrate, 0.94%*	**32. 03-03-024C: Specialty high Performance ammonium nitrate rocket propellant:** *79.52% ammonium nitrate, 11.64% chromium acetylacetonate, 8.84% potassium nitrate*

impurities	
33. 03-03-023B: High Performance ammonium nitrate rocket propellant: *50% ammonium nitrate, 21.42% magnesium bicarbonate, 14.28% nitrocellulose, 7.14% aluminum powder, 5.71% magnesium, 1.42% aluminum stearate catalyst, 0.03% balance*	**34. 03-03-024A: Specialty high Performance polymer-based ammonium nitrate rocket propellant:** *64% ammonium nitrate, 18.8% polyurethane, 16% aluminum powder, 1.2% ethylene oxide polymerization agent*
35. 3-03-025A High Performance smokeless polymer rocket propellant: *82.29% ammonium nitrate, 17.45% copolymer binder, 0.249%% milori blue catalyst, 0.011% residual balance*	

03-03-001A: High Performance military rocket propellant (JPL X350 type):
Into a standard ball mill, place ***196 grams of ammonium nitrate*** of 100 mesh, followed by ***84 grams of ammonium nitrate*** of 30 microns, followed by ***40 grams of dioctyl azelate***, followed by ***4 grams of copper chromite***, followed by ***200 milligrams of ferric acetylacetonate***, and then 100 grams of Teflon coated steel shot of 4 to 5 millimeters in diameter. Thereafter, thoroughly tumble the mixture for 10 to 15 minutes at room temperature. At the same time, into a standard blender or mixing bowl, equipped with plastic stirring blades rather then sharp steel ones, place ***5.4 grams of poly propylene glycol***, followed by ***24 grams of hexane triol.*** Thereafter, thoroughly blend this mixture for 15 to 30 minutes at room temperature on high speed. After preparing these two mixtures, place both of them into a specially deigned heated blender with vacuum pump and gauge. Thereafter, thoroughly blend the two mixtures on high speed at 30 Celsius under a vacuum of 10 millimeters of mercury for about 35 minutes. Immediately after 35 minutes, equalize the reduced pressure, open the machine, and toss in ***6 grams of 2,4-toluene diisocyante***, and then continue to heat and vacuum blend the mixture on high speed and under a vacuum of about 20 millimeters of mercury at 23 to 25 Celsius for about 10 minutes. Afterwards, the propellant mixture is ready to cast. To do so, simply pour and press the propellant into any desired rocket motor or mold, and then vibrate the motor or mold vigorously to remove any air-bubbles or the like. Finally, let your motor or mold cure for about 1 to 2 weeks at room temperature.
Burn rate: 0.2 to 0.3 inches per second at nominal pressure
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***77.8% ammonium nitrate, 11% dioctyl azelate, 6.6% hexane triol plasticizer, 1.6% 2,4-toluene diisocyanate, 1.5% poly propylene glycol plasticizer, 1.1% copper chromite burn rate accelerator, 0.05% ferric acetylacetonate curing catalyst, 0.35% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Standard military rocket fuel for rockets and missiles.

Rocket motor



03-03-002A: Nitrate based military rocket propellant (smokeless):
Into a suitable beaker or container, place 500 milliliters of acetone, followed by ***100 grams of nitrocellulose***. Thereafter, stir the nitrocellulose mixture until all the nitrocellulose dissolves. Note: more acetone may or may not be needed. If the entire mass of nitrocellulose fails to dissolve, add in more acetone until it does. Now, into a separate clean beaker or suitable container, equipped with motorized stirrer, place ***267 grams of ammonium nitrate***, followed by ***32 grams of corn starch***, and then gently dry blend this mixture for about 5 minutes. After 5 minutes, add in 40 milliliters of water, and then heat the mixture to about 60 Celsius with mild stirring. Continue to heat and stir until the mixture reaches a gel like consistency. When the mixture becomes gelatinized, add in the nitrocellulose/acetone solution, and then continue heating and stirring at about 60 Celsius for about 10 to 15 minutes to form a uniform mixture. Afterwards, the mixture is ready to be used. To use, it simply needs to be pressed into any desirable rocket motor or mold under mild pressure, vibrated to remove air bubbles and the like, and then cured for several days.

Burn rate: Average
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***66.9% ammonium nitrate, 25% nitrocellulose, 8% cornstarch, 0.10% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for general purposes.

03-03-003A: Ammonium nitrate based military rocket propellant with ADN increased power addictive:
Into a suitable mixing bowl, blender, or similar container, place ***79 grams of a thermoplastic phenoxy resin*** (commercially available as Bakelite PKDA-8500 resin), followed by ***59.5 grams of ADN***, followed by ***10 grams of sodium barbiturate***, followed by ***15 grams of finely divided standard carbon black***, and then finally followed by ***320 grams of ammonium nitrate***, and then blend the mixture for about 15 minutes. After 15 minutes, add in ***11.2 grams of acetyl triethylcitrate***, and then immediately thereafter add in ***5 grams of 2,4-toluene diamine***, and then continue to blend the mixture for about 5 to 10 minutes. Immediately thereafter, cast the semi-slurry mixture into any desirable rocket motor, mold, ect., under mild pressure, and then vibrate said munitions to remove air bubbles (if any), and then allow the rocket motor to cure for a day or so.
Burn rate: 10 seconds per inch at 1000 psi at 70 Celsius
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***64% Ammonium nitrate, 15.8% thermoplastic phenoxy resin, 11.9% ADN, 3% carbon black filler, 2.2% acetyl triethylcitrate catalyst, 2% sodium barbiturate stabilizer, 1% 2,4-toluene diamine addictive, 0.10% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for general military and commercial use.

03-03-003B: Ammonium nitrate based military rocket propellant with TNT power addictive:
Into a suitable mixing bowl, blender, or similar container, place ***66.5 grams of a thermoplastic phenoxy resin*** (commercially available as Bakelite PKDA-8500 resin), followed by ***20 grams of TNT***, followed by ***7.5 grams of sodium barbiturate***, followed by ***15 grams of finely divided standard carbon black***, followed by ***1 gram of N-phenylmorpholine***, followed by ***2 grams of ammonium oxalate***, and then finally followed by ***350 grams of ammonium nitrate***, and then blend the mixture for about 15 minutes. After 15 minutes, add in ***33.3 grams of acetyl triethylcitrate***, and then immediately thereafter add in ***4 grams of 2,4-toluene diamine***, and then continue to blend the mixture for about 5 to 10 minutes. Immediately thereafter, cast the semi-slurry mixture into any desirable rocket motor, mold, ect., under mild pressure, and then vibrate said munitions to remove air bubbles (if any), and then allow the rocket motor to cure for a day or so.
Burn rate: Similar to 03-03-003A
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***70% Ammonium nitrate, 13.3% thermoplastic phenoxy resin, 6.6% acetyl triethylcitrate catalyst, 4% TNT, 3% carbon black filler, 1.5% sodium barbiturate stabilizer, 0.8% 2,4-toluene diamine addictive, 0.4% ammonium oxalate burn rate catalyst, 0.2% N-phenylmorpholine inert filler, 0.20% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for general military and commercial use.

03-03-004A: Inexpensive ammonium nitrate high performance rocket propellant:
Into a suitable bal mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***59.4 grams of PPG binder (polyosypropylene glycol***, commercially available), followed by ***10 grams of commercially available dioctyl adipate plasticizer***, followed by ***150 grams of finely powdered magnesium*** of the usual mesh, and then followed by ***275 grams of ammonium nitrate***, and then tumble the mixture at 300 RPM for about 15 minutes. Thereafter, pour the tumbled mixture into a suitable mixing bowl,

blender, or similar container, equipped with motorized stirrer utilizing plastic stir blades, and then add in ***5.5 grams of isophorone diisocyanate curative agent***, followed immediately by ***50 milligrams of dibutyltin diacetate catalyst***, and the moderately blend the mixture for about 10 minutes. After 10 minutes, pour the mixture into any desirable rocket motor, engine, ect., and then cure the munition(s) for several days at room temperature. Heat may be used to speed up the curing process.
Burn rate: 0.15 inches per second at 1000 psi
Pressure exponent: 0.26
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Low.
Percentage: ***54.9% ammonium nitrate, 29.9% magnesium, 11.8% PPG polymer binder, 1.9% dioctyl adipate plasticizer, 1% isophorone diisocyante curative agent, 0.491% mixed residues, 0.009% dibutyltin diacetate curing catalyst***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for general military and commercial use.

03-03-05A: High Performance JPL X360 rocket propellant:
Into a suitable horizontal ball mill, filled with Teflon coated steel shot of the usual diameter and size, place ***105 grams of ground ammonium nitrate***, followed by ***245 grams of ungrounded ammonium nitrate***, followed by ***10 grams of copper chromite***, and then tumble the mixture for about 30 minutes at 150 RPM to form a uniform mixture. Afterwards, into a suitable mixing container, equipped with vacuum gauge, motorized stirrer, and heating source, place the dry tumbled mixture previously prepared, followed by ***119.5 grams of polypropylene glycol 2025***, and then blend the mixture on moderate speed for about 30 minutes under a vacuum of 10 millimeters of mercury at a temperature of 21 Celsius. Thereafter, prepare a curing mixture by adding and mixing with, ***500 milligrams of ferric acetyl acetonate*** to ***24 grams of toluene diisocyante,*** and then quickly remove the vacuum, open the mixing container, and then throw in the curing mixture, and then re-seal the container, apply a vacuum of 10 millimeters of mercury, and then continue to blend the mixture on moderate speed for about 10 minutes at 21 Celsius. Thereafter, open the container once again, and quickly add in ***6 grams of 1,2,6-hexanetriol***, and then re-seal the container, apply the same vacuum as before, and then continue to blend the mixture on moderate speed for about 10 additional minutes. Thereafter, the propellant mixture is ready to be casted. To do so, simply pour it into any desirable rocket motor, engine, mold, ect., and then briefly vibrate the munitions to remove air bubbles, and then cure the munition(s) in an oven at 60 Celsius for about 16 hours. Requires standard rocket propellant ignition compositions.
Burn rate: 0.30 to 0.40 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***68.6% ammonium nitrate, 23.4% polypropylene glycol 2025 plasticizer, 4.7% toluene diisocyante, 1.9% copper chromite burn rate catalyst, 1.1% 1,2,6-hexanetriol, 0.21% mixed impurities, 0.09% ferric acetyl acetonate***
Classification: Deflagrating explosive (classified as propellant).
Use: Widely used high performance rocket propellant with multiple uses.

03-03-06A: High Performance polymer rocket propellant:
As usual, into a suitable mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place ***55 grams of a butadiene methylvinylpyridine copolymer*** of a 90/10 mixture (commercially available), followed by ***12 grams of furnace quality carbon black***, and then blend the mixture on moderate speed for about 5 minutes. Thereafter, into a an appropriate sized separate mixing bowl, equipped with separate motorized stirrer, place ***11 grams of dibutoxyethoxyethyl formal***, followed by ***9.7 grams of Milori blue pigment***, followed by ***10 grams of naphthenic acid***, followed by 50 grams of a ethylene oxide substituted alkly amines wetting agent marketed by the Armour and Co, and then blend the mixture on high speed for about 10 minutes. Thereafter, allow the blended mixture to stand for several minutes, and then decant-off the wetting agent, or use vacuum filtration to remove the wetting agent. After removing the wetting agent, place the collected blended mixture back into the mixing bowl, and then add in the butadiene methylvinylpyridine copolymer/ carbon black mixture (previously prepared), and then continue to blend the mixture on moderate speed for about 10 minutes. After 10 minutes, add in ***2.4 grams of magnesium oxide***, followed by ***1.6 grams of a binder catalyst*** mixture composed of 65% diarylaminoketone and 35% N,N'-diphenyl-p-phenylenediamine reaction products, and sold as Flexamine (commercially available), and then continue to blend the mixture until the temperature of the mixture reaches about 68 Celsius. Note: in some cases, an external heating source, such as hot plate may be needed in order to heat the mixture to 68 Celsius. Either way, once the mixtures temperature has reached about 68 Celsius, slowly add in, in small portions at a time, ***405 grams of dry ammonium nitrate*** of average mesh, and after all the nitrate has been added, continue to blend the mixture for about 10 to 15 minutes at 68 Celsius. Thereafter, the mixture is ready to be pressed and casted. To do so, simply press and vibrate the propellant mixture into any

desirable rocket motor, engine, mold, ect, under average pressure, and then cure the rockets in an oven at 76 Celsius for 18 hours. Note: the pasty mixture (before curing) can be extruded into grain sizes if desired for use in gun casing if desired.
Burn rate: 0.15 to 0.17 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***79.9% ammonium nitrate, 10.8% butadiene copolymer binder, 2.3% carbon black filler, 2.1% dibutoxyethoxyethyl formal plasticizer, 1.97% naphthenic acid catalyst, 1.9% Milori blue pigment burn rate catalsyt, 0.47% magnesium oxide filler, 0.31% binder catalyst, 0.25% wetting agent***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets and missiles with multiple uses. Can also be used as grains for propelling ammunition.

03-03-06A: High Performance ammonium nitrate rocket propellant:
Into a suitable mixing blender, such as a "Baker-Perkins mixer" equipped with vacuum technology, or equivalent, place ***450 grams of polybutadiene***, followed by ***50 grams of 2-methyl-5-vinylpyridine***, and then blend them mixture for about 5 minutes at room temperature. Thereafter, add in ***50 grams of carbon black***, and then continue to blend the mixture for another 5 minutes. After 5 minutes, add in ***8.7 grams of finely powdered sulfur***, followed by ***15 grams of zinc oxide***, followed by ***5 grams of "Aerosol OT"***, which is a dioctyl ester of sodium sulfosuccinic acid, followed by ***15 grams of "Felxamine"***, a commercially available binder composed of 65% complex diarylamineketone, and 35% N,N'-diphenyl-p-phenylenediamine, and continue to blend the mixture for about 5 minutes. After 5 minutes, add in ***40 grams of benzophenone***, followed by ***40 grams of Pentaryl A***", which is a amylbiphenyl, and then continue to blend the mixture for about 60 minutes. After 60 minutes, apply a vacuum of 749 millimeters of mercury for 5 minutes. After 5 minutes, remove the mild vacuum, and then add in ***36.6 grams of epichlorohydrin***, and then continue to blend the mixture without vacuum, for about 10 minutes. After 10 minutes, slowly add in, in small portions at a time, ***4083 grams of ammonium nitrate*** of 40 microns on average, and blend the mixture on moderate speed during the addition. After the addition of the nitrate, continue to blend the mixture for about 60 minutes to form a uniform mixture. After 60 minutes, add in ***99 grams of milori blue pigment agent***, and then blend the mixture for about 5 minutes. After 5 minutes, add in ***12.2 grams of "Butyl-Eight", which is a dithiocarbamate rubber accelerator***, and then blend the mixture on high speed for about 15 minutes. At this point, the temperature of the propellant mixture may have increased above room temperature. Either way, if the temperature of the propellant mixture is bellow 30 Celsius, heat the propellant mixture to 67 Celsius, and then blend the propellant mixture at this temperature for about 10 to 15 minutes. Thereafter, press the mixture into any desirable rocket motor, engine, ect, under standard pressure, and the cure the rockets in an oven at 60 to 80 Celsius for 12 to 18 hours.
Burn rate: 0.15 to 0.21 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***83.2% ammonium nitrate, 9.1% polybutadiene polymer binder, 2% milori blue pigment curing agent, 1% 2-methyl-5-vinylpyridine copolymers, 1% carbon black catalyst filler, 0.81% benzophenone burn rate catalyst, 0.81% Pentary A copolymer catalyst, 0.74% epichlorohydrin polymerization catalyst, 0.30% zinc oxide filler, 0.30% flexamine binder addictive, 0.24% Butyl-eight rubber accelerator, 0.23% mixed residues, 0.17% sulfur burn modifier, 0.1% Aersol OT catalyst,***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for high performance rocket propellants with multiple uses.

03-03-07B: High Performance polymer ammonium nitrate rocket propellant (modified):
Into a suitable mixing blender, such as a "Baker-Perkins mixer", or equivalent, place ***180 grams of polybutadiene***, followed by ***20 grams of 2-methyl-5-vinylpyridine***, and then blend them mixture for about 5 minutes at room temperature. Thereafter, add in ***44 grams of carbon black***, and then continue to blend the mixture for another 5 minutes. After 5 minutes, add in ***40 grams of ZP-211*** (a high molecular weight polyether sold by the Thiokol corporation), followed by ***6 grams of "flexamine"***, followed by ***6.6 grams of magnesium oxide,*** and then followed by ***4 grams of milori blue pigment agent,*** and then blend the mixture on moderate speed for about 15 minutes. After 15 minutes, add in ***72.8 grams of ammonium dichromate,*** followed by ***1447 grams of ammonium nitrate,*** and then blend the mixture on moderate speed during the addition. After the addition of the nitrate, continue to blend the mixture for about 60 minutes to form a uniform mixture. After 60 minutes, quickly add in ***18 grams of anhydrous nickel-II-chloride,*** and then quickly blend the mixture for about 60 seconds, and then cast the mixture into any desirable rocket motor, engine, ect, under standard pressure, and then cure the rockets at room temperature for 48 hours.
Burn rate: 0.15 to 0.2 inches per second at 1000 psi

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***78.7% ammonium nitrate, 9.7% polybutadiene polymer, 3.9% ammonium dichromate, 2.3% carbon black, 2.1% ZP-211 polyether binder, 1% 2-methyl-5-vinylpyridine, 0.97% nickel chloride curing catalyst, 0.45% mixed residues, 0.35% magnesium oxide filler, 0.32% flexamine, 0.21% milori blue pigment***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for making high performance rockets and missiles.

03-03-08A: High Performance smokeless rubber-like rocket propellant:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***200 grams of GR-3 butadiene polymer rubber***, followed by ***60 grams of oil, sold as Cricosol 2XH***, and then followed by ***10 grams of RPA No. 3*** (a xylyl mercaptan solution in inert hydrocarbon solvent), followed by ***10 grams of zinc oxide***, and then followed by ***2 grams of stearic acid***. Thereafter, tumble the mixture at 100 RPM for about 15 to 30 minutes to soften the mixture. Thereafter, add in ***600 grams of additional circosol 2XH oil***, and then continue to tumble the mixture for another 10 to 15 minutes to form a uniform homogeneous mixture. Thereafter, add in ***24 grams of "Captax" (2-mercaptobenolthiazole)***, followed by ***12 grams of "Tuads" (tetramethyl thiuram disulfide)***, followed by ***36 grams of "DPG" (diphenyl guanidine)***, followed by ***40 grams of carbon black***, and then followed by ***12 grams of finely divided sulfur***, and then continue to tumble the mixture for about 10 to 15 minutes at 150 RPM. Thereafter, add in ***3784 grams of ammonium nitrate*** of 50 to 100 mesh, and then continue to tumble the mixture at 150 RPM for about 30 minutes. After 30 minutes, the mixture should be degassed by placing the mixture into a vacuum apparatus, and then a mild vacuum applied while agitating the mixture so as to remove any dissolved gasses. Thereafter, the mixture is ready for pouring. To do so, the fluidized mixture simply needs to be poured into any desirable rocket motor, engine, ect, and then cured in an oven at 104 Celsius for 24 hours. The result will be a rubbery like material that should be ignited using a typical solid rocket propellant igniter composition.
Burn rate: 0.3 inches per second at 400 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***78.9% ammonium nitrate, 13.7% circosol oil, 4.1% rubber binder, 0.83% carbon black, 0.75% diphenyl guanidine, 0.5% Captax accelerator, 0.28% mixed residue,0.25% tetramethyl thiuram disulfide accelerator, 0.25% sulfur burn modifier, 0.20% RPA No. 3, 0.20% zinc oxide, 0.04% stearic acid catalyst,***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for high performance rockets, missiles, take-off-assisted rockets packs, and other devices.

03-03-09A: High Performance smokeless polymer rocket propellant:

Into a suitable mixing bowl, blender, or similar container equipped with motorized stirrer, place ***375 milligrams of finely powdered sulfur***, followed by ***1.5 grams of zinc oxide***, followed by ***10 grams of carbon black***, followed by ***9 grams of Milori blue agent***, followed by ***376.5 grams of ammonium nitrate***, followed by ***500 milligrams of Aerosol-OT wetting agent*** (dioctyl ester of sodium sulfosuccinic acid), and then followed by ***1.5 grams of Flexamine antioxidant*** (25% diarylamine-ketone complex, and complex mixture of amines and phenols, commercially available), and then blend the mixture for about 10 to 15 minutes. Thereafter, add in ***50 grams of a copolymer*** composed of butadiene of 2-methyl-5-vinylpyridine, followed by ***10 grams of dibutoxyethoxyethyl formal plasticizer***, followed by ***500 milligrams of SA-113***, which is N,N-dimethyl-tertiary butyl sulfenyl dithiocarbamate vulcanization accelerator, and then continue to blend them mixture for about 15 minutes. After 15 minutes, the mixture is ready to be casted. To do so, pour, press, and vibrate the mixture into any desirable rocket engine, motor, mold, ect, under the usual techniques, and then cure the munitions in an oven at 76 Celsius for 7 to 14 days. Can be ignited using any standard high performance rocket ignition composition.
Burn rate: 0.15 to 0.2 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Very low.

Percentage: ***81.8% ammonium nitrate, 10.8% Butadiene copolymer, 2.1% dibutoxyethyoxyethyl formal plasticizer, 2.1% carbon black filler, 1.9% milori blue burning catalyst, 0.38% mixed residues, 0.32% zinc oxide catalyst, 0.32% flexamine antioxidant agent, 0.10% aerosol-OT wetting agent, 0.10% SA-113 vulcanization accelerator, 0.08% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used for high performance rockets, missiles, and take-off-assisted rockets packs.

03-03-010A: High Performance smokeless polymer rocket propellant:

Into a suitable empty ball mill, place ***2.1 grams of magnesium oxide***, followed by ***41 grams of ammonium dichromate***, followed by ***375 grams of ammonium nitrate***, followed by ***13.5 grams of Milori blue***, and then tumble the mixture at 50 to 100 RPM for about 30 to 40 minutes. Thereafter, or in the mean time, into a separate clean beaker, or similar container, equipped with motorized stirrer, place ***28 grams of a copolymer 1,3-butadiene-2-methyl-5-vinylpyridine***, and then begin to blend this rubbery polymer. Shortly thereafter, add in ***10.5 grams of Philblack E*** (a furnace black sold by the Phillips Petroleum Company), followed by ***27 grams of polybutadiene*** compound sold as "Butarez 15 plasticizer, and then continue to blend the mixture for about 5 minutes. After 5 minutes, immediately add all the dry ingredients from the ball mill, and then continue to blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready to be casted. To do so, it simply needs to be poured, pressed, and vibrated into any desirable rocket motor, engine, mold, ect, under the usual means, and then cure in an oven at 120 Celsius for about 3 hours. Can be ignited using any desirable means.
Burn rate: 0.4 to 0.41 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***75.4% ammonium nitrate, 8.2% ammonium dichromate, 5.6% butadiene coplymer, 5.4% polybutadiene plasticizer, 2.7% milori blue burn catalyst, 2.1% philblack E furnace black, 0.42% magnesium oxide, 0.18% mixed residues***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-03-010A: High Performance smokeless polymer rocket propellant:

Into a standard ball mill, filled with 200 grams of Teflon coated stainless shot of 10 millimeters in diameter, place ***62.5 grams of 1,3-butadiene copolymer***, followed by ***6.9 grams of 2-methyl-5-vinylpyridine***, followed by ***13.8 grams of carbon black***, and then tumble the mixture at 150 RPM for about 5 minutes. After 5 minutes, add in ***407.5 grams of ammonium nitrate***, followed by ***2.7 grams of dibutoxyethoxyethyl formal plasticizer***, followed by ***360 milligrams of zinc oxide*** curing catalyst, and then finally followed by ***10 grams of milori blue burning rate catalysts***, and then continue to tumble the mixture at 150 RPM at room temperature for about 30 to 40 minutes. Thereafter, the tumbled mixture is ready for casting. To do so, it needs to be poured, pressed, and vibrated into any desirable rocket motor, engine, ect, under the usual means, and then cured at 120 Celsius for 3 to 4 hours.
Burn rate: 0.34 to 0.4 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***80.8% ammonium nitrate, 12.4% 1,3-butadinen copolymer, 2.7% carbon black, 1.9% milori burn rate catalyst, 1.3% 2-methyl-5-vinylpyridine, 0.53% formal plasticizer, 0.30% mixed residues, 0.07% zinc oxide curing catalyst***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-03-011A: High Performance rocket propellant:

Into an empty heated ball mill, place ***75 grams of dinitrotoluene***, and then gradually heat the nitro compound to 120 Celsius. When the nitro compound reaches a temperature of about 120 Celsius, add in ***50 grams of finely divided PVC***, and then tumble the mixture at 150 RPM at 120 Celsius for about 5 minutes. Thereafter, add in ***25 grams of Prussian blue pigment***, followed by ***25 grams of finely powdered carbon black***, followed by ***25 oleyl dimethyl ethyl ammonium bromide surfactant***, and then followed by ***440 grams of ammonium nitrate*** of average microns, and then continue to tumble the mixture at 150 RPM for about 1 hour at 120 Celsius to form a uniform mass. Thereafter, the propellant mixture is ready to be poured. To do so, pour, press, and vibrate the mixture, before it cools, into any desirable rocket motor, engine, mold, ect., and then allow the munitions to cool and cure for several days or so.
Burn rate: 0.12 to 0.15 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***68.7% ammonium nitrate, 11.7% dinitrotoluene plasticizer, 7.8% PVC binder, 3.9% Prussian blue burn rate catalyst, 3.9% carbon black filler, 3.9% surfactant, 0.10% mixed residues***
Classification: Deflagrating explosive (classified as propellant).
Use: Used as a propellant in anti-ship missiles, and long-range rockets and missiles.

03-03-011B: High Performance rocket propellant (modified):
Into an empty heated ball mill, place ***39 grams of dinitrotoluene***, followed by ***39 grams of 2,4-dinitrodiphenyl ether***, and then gradually heat the nitro compounds to 120 Celsius. When the nitro compounds reach a temperature of about 120 Celsius, add in ***26 grams of finely divided PVC***, and then tumble the mixture at 150 RPM at 120 Celsius for about 5 minutes. Thereafter, add in ***5 grams of Prussian blue pigment***, followed by ***10 grams of ammonium dichromate***, and then followed by ***380 grams of ammonium nitrate*** of average microns, and then continue to tumble the mixture at 150 RPM for about 1 hour at 120 Celsius to form a uniform mass. Thereafter, the propellant mixture is ready to be poured. To do so, pour, press, and vibrate the mixture, before it cools, into any desirable rocket motor, engine, mold, ect., and then allow the munitions to cool and cure for several days.
Burn rate: 0.20 to 0.25 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***76% ammonium nitrate, 7.8% dinitrotoluene plasticizer, 7.8% 2,4-dintrodiphenyl ether plasticizer, 5.2% PVC binder, 2% ammonium dichromate catalyst, 1% Prussian blue burn rate catalyst, 0.20% mixed residues***
Classification: Deflagrating explosive (classified as propellant).
Use: Used as a propellant in anti-ship missiles, and long-range rockets and missiles.

03-03-012A: A high performance JATO (jet assisted take-off) rocket propellant:
Into a suitable beaker or similar container, equipped with motorized stirrer of the usual means, place ***40 grams of 2,4,-dinitrodiphenyl ether***, followed by ***40 grams of ethylene glycol diglycolate***, and then heat the mixture to 140 Celsius, and then blend the mixture at this temperature for about 10 to 15 minutes to form a homogenous mixture. Thereafter add in ***23.7 grams of cellulose acetate***, in small portions at a time, while thoroughly blending the mixture After the addition of all the cellulose acetate, lower the temperature to 120 Celsius, and when this new temperature is achieved, add in ***11.5 grams acetonylacetone dioxime***, and then continue to blend the mixture for about 10 to 15 minute at 120 Celsius. Thereafter, add in ***255 grams of ammonium nitrate*** of 325 mesh, and then continue to blend the mixture at 120 Celsius for about 5 to 10 minutes on high speed. Now, into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***109.4 grams of ammonium nitrate*** of 325 mesh, followed by ***5 grams of finely divided carbon black***, and then followed by ***15 grams of Prussian blue pigment catalyst***, and then tumble the mixture for about 30 minutes at 500 RPM. After this 30-minute tumbling operation, add this tumbled mixture to the heated mixture in the beaker or similar container, and then continue to blend the mixture at 120 Celsius for about 30 minutes to form a uniform well-mixed mixture. Note: the last 15 minutes of the mixing period should be conducted under a vacuum of 15 millimeters of mercury for best results (degassing). Afterwards, the mixture is ready for use. To use, the mixture simply needs to be poured and vibrated into any desirable rocket motor, engine, mold, ect., and then allowed to cure at room temperature for several days or more.
Burn rate: 0.18 to 0.26 inches per second at 500 and 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on combustion exponent).
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***72.9% ammonium nitrate, 8% 2,4,-dinitrodiphenyl ether, 8% ethylene glycol diglycolate, 4.7% cellulose acetate, 3% Prussian blue pigment catalyst, 2.3% acetonylacetone dioxime, 1% carbon black, 0.10% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in JATO rocket assisted munitions.

03-03-013A: High Performance ammonium nitrate "plastic-like" propellant:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***210 grams of absolutely dry ammonium nitrate***, followed by ***45 grams of finely powdered aluminum*** of the usual size or mesh, and then followed by ***45 grams of aluminum stearate***. Thereafter, gently heat the mixture to about 120 Celsius, and blend the mixture during the heating process. When the temperature reaches 120 Celsius, the aluminum stearate should melt, forming a plastic mass. When the temperature of the mixture reaches 120 Celsius, rapidly blend the mixture for about 5 to 10 minutes to form a gooey-mass. Note: monitor the temperature and the mixing time as the aluminum stearate may polymerize and then solidify. If solidification results, the mixture is worthless and the ammonium nitrate will have to be discarded or recovered by drowning into water. After the brief mixing time, the hot gooey mixture is ready to be cast. To do so, pour, press, and vibrate the mass into any desirable rocket motor, engine, mold, ect, in the usual means, and then allow the munition or mold to cure at room temperature for a 24 hours. Can be initiated using a black powder charge or typical ignition composition.

Burn rate: 0.20 to 0.25 inches per second at 1000 psi.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on pressure exponent).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***70% ammonium nitrate, 15% aluminum, 15% aluminum stearate***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets and missiles for military and/or commercial use.

03-03-014A: High Performance ammonium nitrate propellant:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***120 grams of a rubbery polymer***, followed by ***60 grams of a reinforcing agent***, followed by ***120 grams of plasticizer***, followed by ***12 grams of wetting agent***, followed by ***3.6 grams of an antioxidant***, followed by ***6 grams of a vulcanization accelerator***, followed by ***2.4 grams of sulfur***, followed by ***30 grams of a quaternizing agent***, and then followed by ***6 grams of a metal oxide***. Thereafter, blend this mixture of chemicals for about 15 minutes to form a uniform binder mixture. Thereafter, into clean ball mill, filled with Teflon coated steel shot of the usual size and weight, place ***470 grams of ammonium nitrate***, followed by ***50 grams of ammonium dichromate***, followed by ***25 grams of ferrous ferrocyanide***, and then followed by ***40 grams of the binder mixture prepared previously***. Thereafter, blend the mixture for about 30 to 40 minutes on moderate speed to form a uniform mixture. Thereafter, the mixture is read for use. To use, the mixture simply needs to be pressed at 12,000 psi into any desirable rocket motor, engine, ect., in the usual manner. Can be ignited using the typical means. Note: This mixture can be extruded using die cast machines under high pressure to make gun propellants.
Burn rate: 0.20 to 0.21 inches per second at 1000 psi (average burn tests).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on pressure exponent).
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: Very low.
Percentage: ***80.34% ammonium nitrate, 8.54% ammonium dichromate, 6.83% binder, 4.27% ferrous ferrocyanide burn catalyst, 0.02% balance***
Percentage 2 (binder—of total composition): ***2.28% rubbery polymer, 2.28% plasticizer, 1.14% reinforcing agent, 0.56% quaternizing agent, 0.23% wetting agent, 0.12% vulcanization accelerator, 0.12% metal oxide, 0.06% antioxidant, 0.04% sulfur***
Binder ingredients:
A. Rubbery polymer: Can be any polymer with a "Mooney" (ML-4) value of 10 to 40.
B. Plasticizer: Pentaryl A, Paraflux, Circosol-2XH, or dioctyl phthalate
C. Reinforcing agent: carbon black, wood flour, lignin, styrene-divinylbenzene, or methyl acrylatedivinylbenzene
D. Quaternizing agent: Methyl iodide, methyl bromide, methylene iodide, ethylene bromide, or methyl sulfate
E. Wetting agent (helps deflocculates or disperse the oxidizer): Aersol OT, lecithin, or Duomeen C diacetate
F. Vulcanization accelerator: N,N-dimethyl—S-tert-butyl sulfenyl dithiocarbamate, or butyl-eight (dithiocarbamate rubber accelerator).
G. Metal oxide: Iron oxide, zinc oxide, magnesium oxide, or calcium oxide
H. antioxidant: Flexamine, phenyl-beta-naphthylamine, 2,2-methylene-bis-(4-methyl-6-tert-butylphenol)
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance rockets and missiles, or for making ammonium nitrate gun propellants.

03-03-015A: High Performance ammonium nitrate rocket propellant utilizing asphalt:
Into a suitable beaker of similar container, equipped with motorized stirrer, place ***114.7 grams of N,N-dimethyl acrylamide***, followed by ***384.05 grams of ammonium nitrate***, and then blend the mixture for about 5 to 10 minutes. Thereafter, add in ***1.25 grams of methyl amyl ketone peroxide***, and then blend the mixture for about 10 to 15 minutes to form a homogenous mixture. Thereafter, the mixture is ready for casting. To do so, it simply needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual fashion, and then place the munitions in an oven and heat to 50 to 90 Celsius for several hours. The propellant material can be ignited using any suitable means.

Burn rate: 0.10 at standard pressure

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8 (based on rate of combustion)

Ease of ignition (1 to 10): 7 ½ (based on black powder ignition).

Tendency to cake: None

Explosive ability: Moderate, only under severe conditions.

Percentage: ***76.81% ammonium nitrate, 22.94% N,N-dimethyl acrylamide, 025% methyl amyl ketone peroxide curing catalyst***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in rockets and missiles for the usual uses.

03-03-016A: High Performance ammonium nitrate rocket propellant utilizing ammonium dichromate burn rate catalyst: Into a suitable beaker of similar container, equipped with motorized stirrer, place ***21 grams of diethylene glycol***, followed by ***21.66 grams of adipic acid***, followed by ***856 milligrams of maleic anhydride***, followed by ***13.3 grams of styrene***, followed by ***61.4 grams of methyl acrylate,*** and then blend the mixture for about 5 to 10 minutes. Thereafter, add in ***9.95 grams of ammonium dichromate***, followed by ***363.95 grams of ammonium nitrate***, and then continue to blend the mixture for about 10 to 15 minutes to form a homogenous mixture. Thereafter, add in ***490 milligrams of lecithin***, followed by ***1.96 grams of benzoyl peroxide***, and then continue to blend the mixture for about 1 to 5 minutes on rapid speed. Note: after adding the benzoyl peroxide polymerization catalyst, the mixture may begin to immediately set. Thereafter, the mixture is ready for casting. To do so, it simply needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual fashion, and then place the munitions in an oven and heat to 50 to 90 Celsius for several hours. Exact curing times may vary. The propellant material can be ignited using any suitable means.

Burn rate: 0.13 inches per second at standard pressure

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8 (based on rate of combustion).

Ease of ignition (1 to 10): 7 ½ (based on black powder ignition).

Tendency to cake: None

Explosive ability: Moderate, only under severe conditions.

Percentage: ***73.58% ammonium nitrate, 12.41% methyl acrylate, 4.37% adipic acid, 4.24% diethylene glycol, 2.68% styrene, 2% ammonium dichromate, 0.396% benzoyl peroxide, 0.17% maleic anhydride, 0.099% lecithin, 0.065% balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in rockets and missiles for the usual uses.

03-03-016B: High Performance ammonium nitrate rocket propellant utilizing ammonium dichromate burn rate catalyst: Into a suitable beaker of similar container, equipped with motorized stirrer, place ***14 grams of diethylene glycol***, followed by ***14 grams of adipic acid***, followed by ***1 gram of maleic anhydride***, followed by ***14 grams of styrene***, followed by ***62 grams of methyl acrylate,*** and then blend the mixture for about 5 to 10 minutes. Thereafter, add in ***10 grams of ammonium dichromate***, followed by ***380 grams of ammonium nitrate***, and then continue to blend the mixture for about 10 to 15 minutes to form a homogenous mixture. Thereafter, add in ***2 grams of lecithin***, followed by ***2 grams of methyl ethyl ketone peroxide***, followed by ***500 milligrams of cobalt octoate***, and then continue to blend the mixture for about 1 to 5 minutes on rapid speed. Note: after adding the peroxide, lecithin, and cobalt compound polymerization catalysts, the mixture may begin to immediately set. Thereafter, the mixture is ready for casting. To do so, it simply needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual fashion, and then place the munitions in an oven and heat to 60 Celsius for several hours. Exact cure times may vary. The propellant material can be ignited using any suitable means.

Burn rate: 0.10 to 0.13 inches per second at 500 psi

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8 ¼ (based on rate of combustion).

Ease of ignition (1 to 10): 7+ (based on black powder ignition).

Tendency to cake: None

Explosive ability: Moderate, only under severe conditions.

Percentage: ***76% ammonium nitrate, 12.4% methyl acrylate, 2.8% diethylene glycol, 2.8% styrene, 2.8% adipic acid, 2% ammonium dichromate, 0.4% lecithin, 0.4% methyl ethyl ketone peroxide, 0.2%, 0.1% cobalt octoate, 0.1% balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in rockets and missiles for the usual uses.

03-03-017A: Specialty ammonium nitrate semi-solid (gelled) rocket propellant (with increase moldability): This procedure is identical to the 03-01-029A, but the ammonium perchlorate is simply replaced by ammonium nitrate. Into a suitable beaker of similar container, equipped with motorized stirrer, place ***223.5 grams of regular unleaded gasoline,*** and then add in ***26.5 grams of aluminum naphthenate*** (containing 7.55% aluminum by weight). Thereafter, stir the mixture for about 10 to 15 minutes to form a gel. Thereafter, add in ***37.5 grams of carbon black***, and then followed by ***712.5 grams of ammonium nitrate***, and then blend the mixture for about 20 to 30 minutes. Thereafter, the moldable mass is ready for use. To do so, it simply needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual fashion. The gelled propellant mixture can be ignited using any suitable means. Note: test the bun rate using a small sample before committing to a rocket munition for safety—stories of rocket motors exploding without warning have been reported, so use caution.

Burn rate: Burns smoothly.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8 to 9 (based on rate of combustion)

Ease of ignition (1 to 10): 6 ¾ (based on black powder ignition).

Tendency to cake: None

Explosive ability: Normally none. Has been known to explode.

Percentage: ***71.25% ammonium nitrate, 22.35% unleaded gasoline, 3.75% carbon black, 2.65% aluminum naphthenate***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used to propel rockets and missiles. Can also be used as a gas generator.

03-03-018A: Specialty ammonium nitrate rocket propellant with moderate acceleration for use in spacecraft: Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter, place ***425 grams of ammonium nitrate***, followed by ***125 grams of finely divided aluminum powder.*** Thereafter, tumble the mixture at 100 RPM for about 1 hour to for a uniform mixture. Now, into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual means, place ***180 grams of a hydroxyl terminated polypropylene oxide*** (PPG), obtainable from Union Carbide Corporation and sold as PPG 2025, followed by ***25 grams of trimethylol propane*** (TMP), followed by ***25 grams of 1-decanol***, followed by ***50 grams of 2,6-tolyl-diisocyante compound***, and then blend the mixture for 30 minutes on high speed. Thereafter, add in ***5 grams of ferric acetyl acetonate curing catalyst***, and then blend the mixture for about 10 minutes. After 10 minutes, pour, press, and vibrate the propellant mixture into any desirable rocket motor, engine, ect., in the usual manner, and then cure the munitions in an oven at 60 Celsius for about 3 to 6 days. Thereafter, the propellant can be fired using any desirable ignition composition.

Burn rate: 0.1 to 0.3 (depends on curing time and temperature).

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 7+ (based on actual pressure exponent, not unconfined burn).

Ease of ignition (1 to 10): 7+ (based on black powder ignition).

Tendency to cake: None

Explosive ability: Very little, but may under severe conditions.

Percentage: ***50.89% ammonium nitrate, 21.55% hydroxyl terminated polypropylene oxide copolymer, 14.97% aluminum metal fuel, 5.98% 2,6-tolyl-diisocyante curing compound, 2.99% 1-decanol addictive, 2.99% trimethylol propane antioxidant, 0.59% ferric acetyl acetonate curing catalyst, 0.04% impurities***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used to propel spacecraft. Can also be used to propel wire or laser guided missiles.

03-03-019A: High Performance ammonium nitrate rocket propellant with nitrocellulose base: Into a suitable mixing bowl, equipped with motorized stirrer, place ***200 grams of triacetin***, followed by ***50 grams of diethyl phthalate***, followed by ***250 grams of nitrocellulose (average nitrogen content)***, and then followed by ***2.5 grams of lecithin.*** Thereafter, blend the mixture on moderate speed for about 15 minutes to form a nice slurry. Thereafter, add in ***450 grams of ammonium nitrate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 70 Celsius for about 2 days. A standard ignition composition can be used for proper burn.

Burn rate: Unknown.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9

Ease of ignition (1 to 10): 7

Tendency to cake: None

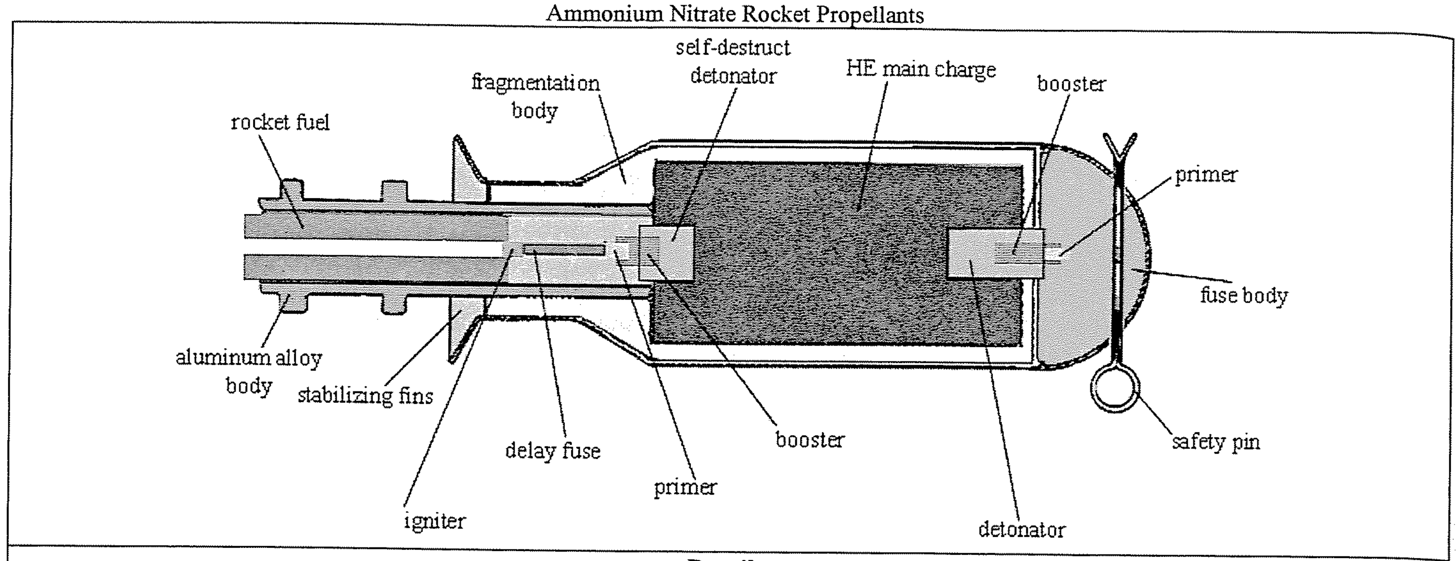
Explosive ability: Stable.

Percentage: ***47.24% ammonium nitrate, 26.24% nitrocellulose, 20.99% triacetin, 5.24% diethyl phthalate, 0.26% lecithin, 0.03% mixed balance***

Classification: Deflagrating explosive (classified as propellant).

Use: Can be used in military and commercial rockets and missiles for the usual uses.

Rocket with warhead assembly



Details:

Illustration shows the rocket portion and the warhead in detail. The warhead consists of a standard high explosive charge, initiated by a forward detonator, or base detonator. This design shows a self-destruct mechanism. The self-destruct mechanism works by the burning of the rocket grain to an igniter. This igniter setoff a delay element, which burns to a primer, the primer sets-off the booster, which detonates the base detonator.

03-03-019B: High Performance ammonium nitrate rocket propellant with nitrocellulose base:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***500 grams of dimethoxyethyl phthalate***, followed by ***500 grams of nitrocellulose (average nitrogen content)***, and then followed by ***5 grams of lecithin***. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a nice slurry. Thereafter, add in ***960 grams of ammonium nitrate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 70 Celsius for about 2 days. A standard ignition composition can be used for proper burn.
Burn rate: 0.15 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***48.85% ammonium nitrate, 25.44% dimethoxyethyl phthalate, 25.44% nitrocellulose, 0.25% lecithin, 0.,02% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-03-020A: High Performance ammonium nitrate rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***105 grams of cellulose acetate***, followed by ***30.5 grams of finely divided carbon black***, followed by ***10 grams of disodium barbiturate***, and then followed by ***104.5 grams of dinitrophenoxyethanol***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***622.4 grams of ammonium nitrate***, followed by ***118.5 grams of acetyl triethyl citrate***, and then followed by ***10 grams of toluene diamine***. Thereafter, blend the mixture on moderate speed for about 45 minutes at room temperature. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under mild vacuum for about 25 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at moderate temperature for about 24 to 36 hours. A standard ignition composition can be used for proper burn.
Burn rate: Average at 1200 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Stable.

Percentage: ***62.18% ammonium nitrate, 11.83% acetyl triethyl citrate binder, 10.49% cellulose acetate binder, 10.44% dinitrophenoxyethanol, 3.04% carbon black filler, 0.99% disodium barbiturate catalyst, 0.99% toluene diamine cure catalyst, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-03-021A: High Performance ammonium nitrate rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***375 grams of ammonium nitrate***, followed by ***13.5 grams of Milori blue pigment agent***, followed by ***2 grams of magnesium oxide (light)***, followed by ***10 grams of carbon black***, followed by ***41 grams of ammonium dichromate***, followed by ***27 grams of polybutadiene***, and then followed by ***28 grams of any desired epoxy resin or copolymer binder***. Thereafter, blend the mixture on moderate speed for about 45 minutes at room temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 90 Celsius for about 6 to 8 days. A standard ignition composition can be used for proper burn.
Burn rate: 0.40 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***75.52% ammonium nitrate, 8.25% ammonium dichromate, 5.63% copolymer binder, 5.43% polybutadiene, 2.71% Milori blue catalyst, 2% carbon black filler, 0.40% magnesium oxide catalyst, 0.06% mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-03-022A: High Performance ammonium nitrate rocket propellant with ferric nitrate burn accelerator:
Into a suitable ball mill or vertical mixer, place ***425 grams of ammonium nitrate*** of average mesh, and the followed by ***25 grams of ferric nitrate monohydrate***. Thereafter, add in 200 grams of Teflon coated steel shot, and then tumble or rotate the mixture at high RPM for about 1 hour. Thereafter, separate the mixture from the steel shot using the desired screen method, and the place this separated mixture into suitable mixing bowl, equipped with motorized stirrer, in the usual means, and then add in ***100 grams of polybutadiene*** of viscosity of 1500. Thereafter, blend the mixture for about 1 hour at room temperature. Thereafter, the mixture is reedy for use. To use the mixture simply needs to be pressed and vibrated into any desirable rocket motor, mold, engine, ect., under pressure in the usual means, and the resulting rockets need to be cured in an oven at 82 Celsius for about 24 hours to form a rigid and hard propellant grain.
Burn rate: 0.10 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***77.27% ammonium nitrate, 18.18% polybutadiene, 4.54% ferric nitrate monohydrate, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual means.

03-03-023A: High Performance ammonium nitrate rocket propellant:
Into a suitable ball mill or vertical mixer, place ***700 grams of ammonium nitrate***, followed by ***350 grams of magnesium bicarbonate***, followed by ***200 grams of nitrocellulose***, and then followed by ***100 grams of aluminum powder***. Thereafter, add in 300 grams of Teflon coated steel shot, and then tumble or rotate the mixture at 200 RPM for about 1 hour. Note: during this one hour tumbling period, spray in 100 milliliters of hexane, in small portions at a time, during the 1 hour period. Thereafter, separate the mixture from the steel shot using the desired screen method. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable rocket motor, mold, engine, ect., under high pressure in the usual means.
Burn rate: Not calculated—may vary.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None
Explosive ability: Stable.

Percentage: ***51.85% ammonium nitrate, 25.92% magnesium bicarbonate, 14.81% nitrocellulose, 7.4% aluminum powder, 0.02% balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual means, or for use in low pressure, low velocity systems.

03-03-024A: Specialty high Performance ammonium nitrate rocket propellant:
Into a suitable ball mill, or vertical mixer, place ***394.4 grams of ammonium nitrate***, and then followed by ***43.8 grams of potassium nitrate***, and then tumble or rotate the mixture at 100 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***61.8 grams of ammonium tricatechol chromate***. Thereafter, add in 150 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for pressing. To do so, the mixture needs to be pressed under high pressure into any desired rocket motor, engine, ect., and then cured in an oven at ordinary temperatures.
Burn rate: 0.30 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 6
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***78.88% ammonium nitrate, 12.36% ammonium tricatechol chromate, 8.76% potassium nitrate***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets and missiles for the usual purposes.

03-03-024B: Specialty high Performance ammonium nitrate rocket propellant:
Into a suitable ball mill, or vertical mixer, place ***368 grams of ammonium nitrate***, and then followed by ***41 grams of potassium nitrate***, and then tumble or rotate the mixture at 100 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***51 grams of pyridine tricatechol chromate***. Thereafter, add in 150 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for pressing. To do so, the mixture needs to be pressed under high pressure into any desired rocket motor, engine, ect., and then cured in an oven at ordinary temperatures.
Burn rate: 0.26 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***80% ammonium nitrate, 10.86% pyridine tricatechol chromate, 8.2% potassium nitrate, 0.94% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets and missiles for the usual purposes.

03-03-024C: Specialty high Performance ammonium nitrate rocket propellant:
Into a suitable ball mill, or vertical mixer, place ***397.6 grams of ammonium nitrate***, and then followed by ***44.2 grams of potassium nitrate***, and then tumble or rotate the mixture at 100 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***58.2 grams of chromium acetylacetonate***. Thereafter, add in 150 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for pressing. To do so, the mixture needs to be pressed under high pressure into any desired rocket motor, engine, ect., and then cured in an oven at ordinary temperatures.
Burn rate: 0.14 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***79.52% ammonium nitrate, 11.64% chromium acetylacetonate, 8.84% potassium nitrate***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets and missiles for the usual purposes.

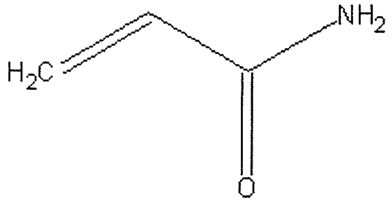
03-03-023B: High Performance ammonium nitrate rocket propellant:
Into a suitable ball mill or vertical mixer, place ***700 grams of ammonium nitrate***, followed by ***300 grams of magnesium bicarbonate***, followed by ***200 grams of nitrocellulose***, followed by ***20 grams of aluminum stearate***, followed by ***100 grams of aluminum powder***, and then followed by ***80 grams of magnesium powder***. Thereafter, add in 300 grams of Teflon coated steel shot, and then tumble or rotate the mixture at 200 RPM for about 1 hour. Note: during this one hour tumbling period, spray in 100 milliliters of hexane, in small portions at a time, during the 1 hour period. Thereafter, separate the mixture from the steel shot using the desired screen method. Thereafter, the mixture is reedy for use. To use, the mixture simply needs to be pressed into any desirable rocket motor, mold, engine, ect., under high pressure in the usual means.
Burn rate: Not calculated—may vary.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***50% ammonium nitrate, 21.42% magnesium bicarbonate, 14.28% nitrocellulose, 7.14% aluminum powder, 5.71% magnesium, 1.42% aluminum stearate catalyst, 0.03% balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual means, or for use in low pressure, low velocity systems.

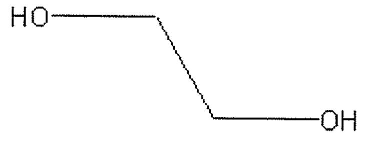
03-03-024A: Specialty high Performance polymer-based ammonium nitrate rocket propellant:
Into a suitable ball mill or vertical mixer, place ***94 grams of polyurethane***, followed by ***80 grams of aluminum powder***, and then followed by ***320 grams of ammonium nitrate***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***6 grams of ethylene oxide***. Thereafter, blend the mixture on high speed for about 45 minutes in the absence of air. Thereafter, the mixture is reedy for use. To use, the mixture simply needs to be pressed into any desirable rocket motor, mold, engine, ect., and then cured in an oven at 60 Celsius for about 72 hours.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on average burn rate).
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***64% ammonium nitrate, 18.8% polyurethane, 16% aluminum powder, 1.2% ethylene oxide polymerization agent***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual means.

03-03-025A: High Performance smokeless polymer rocket propellant:
Into a suitable heated ball mill, or vertical mixer, place 500 grams of Butadiene/2-methyl-5-vinylpyridine copolymer, and then followed by 100 grams of carbon black. Thereafter, tumble or mix the mixture at 150 RPM at 55 Celsius for about 1 hour. Thereafter, add in 100 grams of TP-90B (dibutoxy-ethoxy-ethyl-formal), followed by 5 grams of SA-113 (N,N-dimethyl-tert-butylsulfenyl-dithiocarbomate), followed by 3.75 grams of powdered sulfur, followed by 15 grams of zinc oxide, followed by 15 grams of "flexamine", and then followed by 5 grams of Aersol-OT (dioctyl ester of sodium sulfosuccinic acid). Thereafter, blend the entire mixture for about 2 hours at 55 Celsius. Thereafter, place ***525 grams of the above binder mixture***, and then add in ***2475 grams pre-dried ammonium nitrate***, and then followed by ***7.5 grams of milori blue***. Thereafter, blend the mixture on high speed for about 6 hours at 70 Celsius. Afterwards, the mixture is ready to be casted. To do so, pour, press, and vibrate the mixture into any desirable rocket engine, motor, mold, ect, under the usual techniques, and then cure the munitions in an oven at 82 Celsius for 24 hours. Can be ignited using any standard high performance rocket ignition composition.
Burn rate: 0.165 to 0.21 inches per second at 1000 psi (estimated).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: Very low.
Percentage: ***82.29% ammonium nitrate, 17.45% copolymer binder, 0.249%% milori blue catalyst, 0.011% residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in any desired industrial, commercial, or military use.

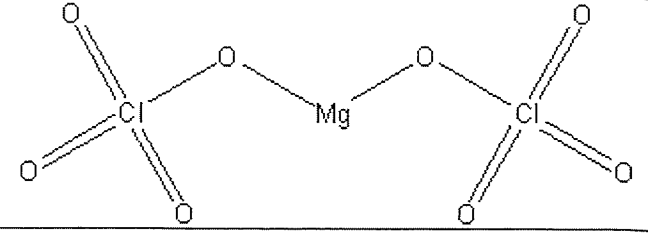
Section 4: Miscellaneous containing

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide**
	
	Acrylamide forms whitish flake-like crystals. The crystals are unstable and polymerize when heated or upon standing at room temperature.
55. Ethylene Glycol	**56. Magnesium Perchlorate**



Ethylene Glycol is a colorless viscous toxic liquid with a boiling point of 197 Celsius, and a melting point of –13 Celsius. Ethylene Glycol is very soluble in water and many organic solvents, and is found in anti-freeze.

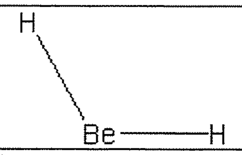


Magnesium Perchlorate forms white hygroscopic granules, or flaky mass. The salt decomposes when heated to 250 Celsius. It dissolves in water with the formation of considerable heat.

57. Metallic Lithium

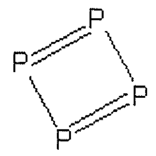
Lithium forms a silvery-white metal, which rapidly tarnishes in moist air. Its melting point is 180 Celsius. The metal reacts violently with water and many organic chemicals. The commercial brand is sold stored under kerosene. Lithium is obtained by heating metallic sodium with lithium chloride.

58. Beryllium Hydride



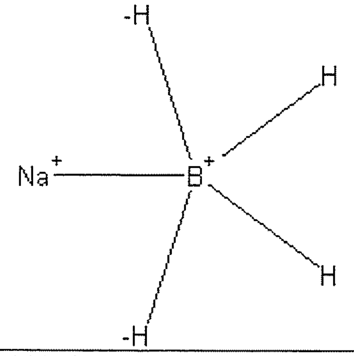
Beryllium Hydride forms a white solid, which begins to decompose when heated to 220 Celsius. The hydride is much more stable then other metal hydrides, and only slowly reacts with water. The salt is relatively insoluble in water and most organic solvents.

59. Red Phosphorus



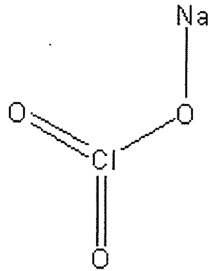
Red Phosphorus forms a red to violet powder, which is stable at room temperature. The solid sublimes when heated to 416 Celsius, but reverts to the white form when distilled at 290 Celsius. Red phosphorus is insoluble in all common solvents, but is capable of dissolving in phosphorus tribromide.

60. Sodium Borohydride



Sodium borohydride forms hygroscopic crystals that are capable of forming a dihydrate. The salt is soluble in water, and can be stored in aqueous solution for several days. Aqueous solutions decompose rapidly when boiled. The salt is very stable in dry air, as compared to other hydrides.

61. Sodium chlorate



Sodium chlorate forms colorless, odorless crystals or white granules. The melting point of the crystals is 248 Celsius, but it begins to decompose into oxygen and sodium perchlorate when heated to 300 Celsius. The crystals are highly soluble in water, but relatively insoluble in alcohol, and most common organic solvents. Sodium chlorate is widely used in pyrotechnic compositions, and in the preparation of ammonium chlorate, and perchlorate, which are used in powerful solid rocket fuels.

Method of Preparation 1:

Step 1: Setting-up a standard diaphragm “salt bridge cell”

A. Introduction

A standard diaphragm cell can be made from simple and inexpensive store bought materials. Anyone can easily assemble their own cell, and carryout interesting and useful procedures to make a variety of interesting products. First of all, you need to learn how to assemble your own homemade cell. The first thing you will need to do is go to the store and purchase the following materials:

1. 1 box of Epsom salt (available in any grocery store)
2. 1 standard clay pot (just under 1 quart size; 500 milliliters; try to find one that does not have a hole in the bottom)
3. 1 plastic Tupperware container w/lid (just under ½ gallon size; about 1800 milliliters)
4. 2 lead electrodes (about 6 inches long each).
5. 1 car battery charger; with power output with at least 12 volt 6 amp (available in most stores for $20.00 to $40.00)

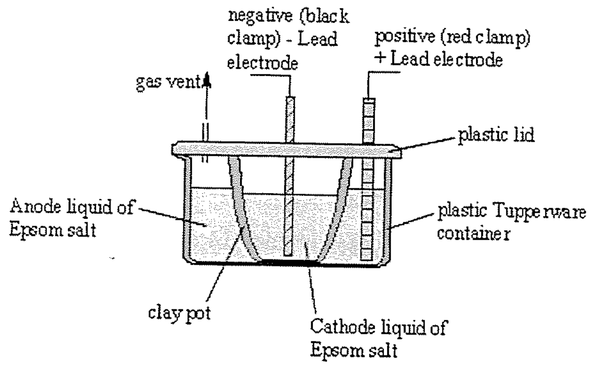
Note: The lead electrodes should be rectangular with dimensions of 5 to 6 inches long, by ½ inch to ¼ inch in diameter (they don’t have to be perfectly round, and can be square or rectangle). The lead electrodes may be circular if desired with dimensions of 6 inches long by 0.30 to 0.50 inch radius (9 millimeter to 12.9 millimeter). The lead electrodes can be made my melting pieces of lead into a make shift mold, made by forming a rectangular shaped mold using aluminum foil. After shaping the mold with the aluminum foil, place the pieces of lead there into, and then use a standard propane torch to melt the lead. After allowing the lead to cool, remove the aluminum foil. Lead can be found in car batteries, and in lead solder for welding copper and in electronics.

Note: The clay pot is a standard clay flowerpot, which can be found at any hardware store or pottery store. The clay pot should not have a hole in the bottom, as most of them do. *If a clay pot with no hole in the bottom is not available, use plumbers putty, or some similar water insoluble product to seal the hole on both sides.*

B. Assemble your cell

Now that you have your materials, assemble your cell. Use the following illustration to aid you. Note: For the electrodes, suitable sized holes should be cut into the plastic lid. One hole on the left or right side of the plastic lid, and the other directly in the center of the plastic lid. The holes if properly cut, can secure the electrodes firmly (with a tight fit). The clay pot is then placed into the plastic Tupperware container as shown in the illustration. Note: The plastic lid should be able to fit securely onto the plastic Tupperware container without disrupting the clay pot. A small hole should also be cut into the plastic lid to allow for gas venting. Note: This cell is not airtight. To make the cell airtight, the holes in which the electrodes protrude need to be sealed airtight. To do this, a glue gun may be used, or plumbers putty. The plastic lid should also be sealed gas tight. To do this, wrap Teflon tape

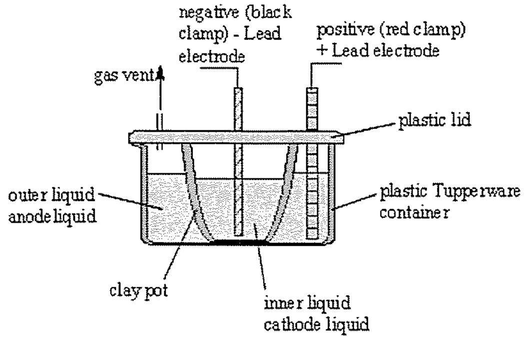
5. Then attach each electrode to their respective electric wire from the battery charger. Note: The battery charger comes with a black clamp, and a red clamp. The black clamp is the "negative", and the red clamp is the "positive". Note: The battery charger only works when plugged in! Before plugging the battery charger in, secure both clamps to the cell. The black clamp goes on the negative (-) lead electrode, and the red clamp goes on the positive (+) lead electrode.
6. When everything is in place, plug the battery charger in, and allow it to run for about 6 hours. Note: During the process, hydrogen gas will be steadily evolved. Carryout the process in a ventilated area, such as a garage, bathroom, or shed.
7. After 6 hours, unplug the battery charger, and remove the clamps from each electrode. Then open the plastic lid, and pullout the clay pot. Note: The clay pot will be filled with a white precipitate. This white precipitate is *magnesium hydroxide*. The cathode liquid will contain a *dilute sulfuric acid solution*. This dilute sulfuric acid solution can be saved, if desired, or mixed with the contents in the clay pot. Mixing both solutions will reform magnesium sulfate (Epsom salt). If you wish to recycle the Epsom salt for future cell charge, mix both liquids. Note: To verify, for your own amusement, drop in a little baking soda to the anode liquid.
8. Finally, rinse out the clay pot with tap water, and do the same for the plastic Tupperware container. Your clay pot is now charged, so proceed with step 2.


negative (black clamp) - Lead electrode
positive (red clamp) + Lead electrode
gas vent
plastic lid
Anode liquid of Epsom salt
plastic Tupperware container
clay pot
Cathode liquid of Epsom salt

Step 2: Preparation of sodium chlorate

Now, dissolve 100 grams (3.5 oz.) of pickling salt into 350 milliliters (11.8 fluid oz.) of hot tap water. Thereafter, place this salt solution into the cathode compartment (-). Thereafter, dissolve 25 grams (1.0 oz.) of pickling salt into 350 milliliters (11.8 fluid oz.) of hot tap water, and then add in 5 drops of concentrated sulfuric acid. Then place this acidified salt solution into the anode compartment (+). Now, assemble the cell as illustrated below, using two lead electrodes, and then begin the operation by turning on your power supply, or by plugging in your battery charger. Allow the cell to electrolysis for about 15 hours at 6 Volt/6 Amp or equivalent—be sure to monitor the temperature so as it does not fall below 50 Celsius. The optimal temperature for maximizing chlorate formation in the cell is around 80 to 90 Celsius.

(available at any hardware store) around the outer lip of the plastic Tupperware container many times, so that when the lid is attached, it forms a firm seal. Note: Other methods may be used to create an airtight cell. Use your own imagination, and see what you can come up with. An airtight seal of your cell is not necessary for most procedures. An airtight seal is only desired if a producing gas is the desired product, as in the production of chlorine gas.

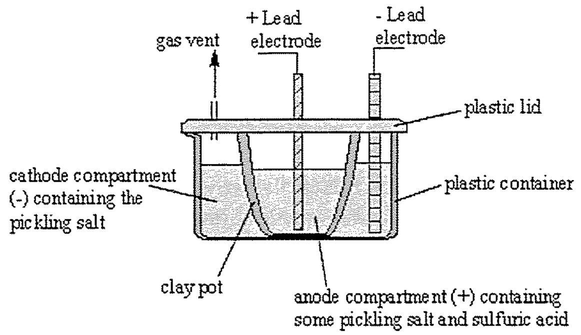

negative (black clamp) - Lead electrode
positive (red clamp) + Lead electrode
gas vent
plastic lid
outer liquid anode liquid
plastic Tupperware container
clay pot
inner liquid cathode liquid

Setup for the assembly of the cell. Note: The lead electrodes can be replaced with graphite, but lead is better to reduce corrosion of the electrodes.

C. Charge your cell

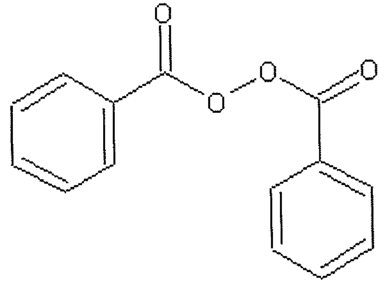
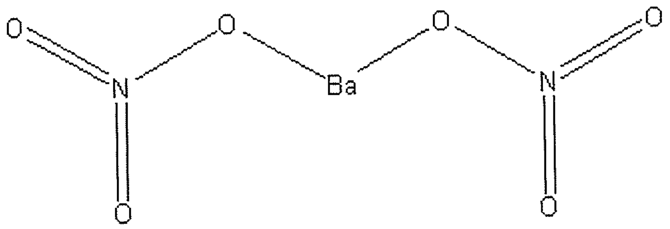
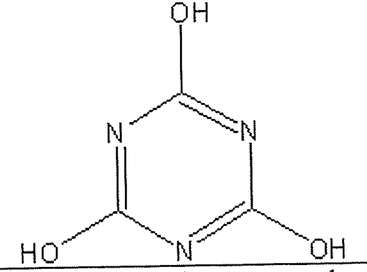
Now that you have setup your cell, the next task is to "charge the cell". What does this mean? Well, to put it into simple terms, the clay pot acts as a salt bridge. In order for this salt bridge to work properly, it must be "Charged" with ions, so that during a particular process, the electrochemical reaction works properly. To charge the cell, carryout the following:

1. Into a beaker or other container, place 1500 milliliters (50.7 fluid oz.) of water. Then add 100 grams (3.6 oz.) of Epsom salt, and stir the water to completely dissolve the Epsom salt.
2. Place 500 milliliters (17 fluid oz.) of this Epsom salt solution into the clay pot. This will be called the "cathode" liquid, designating the "negative" side.
3. Place the remaining Epsom salt solution into the plastic Tupperware container (the outer compartment). This will be called the "anode" liquid, designating the "positive" side.
4. Then secure the plastic lid to the plastic Tupperware container, and then secure both electrodes.


gas vent
+ Lead electrode
- Lead electrode
plastic lid
cathode compartment (-) containing the pickling salt
plastic container
clay pot
anode compartment (+) containing some pickling salt and sulfuric acid

Set-up for the preparation of sodium chlorate from pickling salt. The lead electrodes can be replaced with titanium, chromium, or graphite.

After the 15-hour electrolysis process, unplug your power supply, and then open the cell. Carefully remove the clay pot, and then dump its contents into a clean beaker or similar glass container—the anode compartment will contain the bulk of the sodium chlorate, as well as some bleach, and small amounts of sodium perchlorate and sodium hydroxide. The cathode compartment will contain sodium chloride, and some sodium hydroxide, bleach, and sodium chlorate. You can discard the cathode liquid if desired, or you can recycle it for another crop of chlorate—to do this, simply fortify it with about 50 to 60 additional grams of salt, and then place it back into the cathode compartment. Your sodium chlorate solution (anode liquid) should be quickly filtered, to remove any insoluble materials, and then gently heated to a boil for about 10 minutes to drive-off any dissolved gasses, and to break down any bleach. Thereafter, for best results, pour the entire anode liquid onto a large shallow pan, and then allow to air dry. Blowing air over the surface of the pan using a cooling fan can help speed-up the process. Once all the water has evaporated, there will be left behind crystals of sodium chlorate, sodium hydroxide, and small amounts of sodium chloride, and sodium perchlorate. Now, scrape-up all the crystals, and then place them into a beaker, and then add to this beaker, 250 milliliters (8.5 fluid oz.) of a rubbing alcohol solution prepared by adding and mixing 100 milliliters (3.4 fluid oz.) of rubbing alcohol into 150 milliliters (5 fluid oz.) of warm tap water. Then gently swirl the beaker or similar container for several minutes, and then filter-off the insoluble crystals of the sodium chlorate. Finally, recrystallize these filtered-off crystals from 150 milliliters of hot tap water (see laboratory techniques guide on how to carryout a recrystallization). The final product after recrystallization will be about 95 to 96% sodium chlorate, well suitable for use in making fireworks, or pyrotechnic compositions. Further recrystallizations from boiling water can purify the sodium chlorate further.

62. Lead Dioxide	**63. Benzoyl Peroxide**
$O=Pb=O$	
Lead Dioxide is a brownish, dark brown powder, which evolves oxygen gas when heated. Lead dioxide is a mild oxidizing agent. It is insoluble in water and the usual organic solvents.	Benzoyl peroxide forms colorless crystals or crystalline powder. The pure material may explode when rapidly heated. The crystals have a melting point of about 106 Celsius. It is only slightly soluble in water and alcohol, but is soluble in most common solvents.
64. Barium Nitrate	**65. Cyanuric Acid**
	
Colorless to white crystalline powder, granules, or solid mass. The crystals have a melting point of 500+ Celsius, with decomposition shortly thereafter. Barium nitrate is freely soluble in water, but insoluble in the usual organic solvents. Barium nitrate is toxic so users should wear gloves.	White crystalline solid, which decomposes when heated above 330 Celsius. The free crystals are only slightly soluble in water, and the usual solvents.

- High Performance Miscellaneous Propellants in this section -

1. 03-04-001A: High Performance military rocket propellant (M7 propellant): *54.6% nitrocellulose, 35.4% nitroglycerine, 7.8% potassium perchlorate, 1.2% carbolac I, 0.90% ethyl centralite, 0.020% graphite, 0.080% moisture*	**2. 03-04-002A: High Performance military rocket propellant:** *49.7% HMX, 24% nitroglycerine, 19.9% ammonium perchlorate, 4.7% ethyl acrylate-acrylic acid copolymer, 1% UNOX 221 linking agent, 0.49% carbon black catalyst, 0.210% moisture*
3. 03-04-003A: High Performance CMDB rocket propellants 2 (composite modified Double Base propellants): *34.6% nitroglycerine, 21.9% ammonium perchlorate, 19.9% aluminum, 11% triacetin, 10.9% nitrocellulose, 1% 2-nitrodiphenylamine, 0.35% impurities, 0.29% 2,6-tolylene diisocynate curative, 0.06% lead 2-ethylhexoate catalyst*	**4. 03-04-003B: High Performance CMDB rocket propellants 2 (composite modified Double Base propellants):** *32.2% nitroglycerine, 20% ammonium perchlorate, 20% aluminum, 15% nitrocellulose, 10.3% di-n-propyl adipate, 1% 2-nitrodiphenylamine, 1% resorcinol diacetate, 0.38% 2,6-tolylene diisocyante curative, 0.11% residue, 0.01% ferric acetylacetonate*
5. 03-04-004A: High Performance nitrocellulose/nitroglycerine based rocket propellant: *49.11% nitrocellulose, 35.36% nitroglycerine, 15.02% triacetin, 0.49% nitrodiphenylamine, 0.02% impurities*	**6. 03-04-005A: High Performance "hard, yet flexible" propellant utilizing hydroxylamine perchlorate:** *80% hydroxylamine perchlorate, 10% D.E.R. 32 binder, 10% Epon 812 epoxy resin*
7. 03-04-005B: High Performance "hard, yet flexible" propellant utilizing hydroxylamine perchlorate (modified): *60% hydroxylamine perchlorate, 20% aluminum, 10% D.E.R. 32 binder, 10% Epon 812 epoxy resin*	**8. 03-04-006A: High Performance polymeric propellant utilizing guanidine perchlorate:** *38.5% guanidine perchlorate, 28.4% lithium perchlorate, 20% aluminum, 7% acrylamide, 4.6% ethylene glycol, 0.66% succinic anhydride polymerization catalyst, 0.53% N-methyl morpholine, 0.31% moisture and residue*
9. 03-04-007A: Moderate performance "rubber-like" propellant utilizing potassium perchlorate and polysulfide binder: *59.9% potassium perchlorate, 19.4% polysulfide binder, 9.9% ammonium perchlorate, 7.1% furfuryl alcohol plasticizer, 1.4% lead dioxide vulcanizing agent, 1.4% dibutyl*	**10. 03-04-007B: Moderate performance "rubber-like" propellant utilizing potassium perchlorate and polysulfide binder (modified):** *50% potassium perchlorate, 23% polysulfide binder, 17% ammonium perchlorate, 7.5% furfuryl alcohol plasticizer, 1.3% zinc oxide, 0.68% stearic acid catalyst,*

phthalate dispersion medium, 0.56% mixed residues, 0.34% stearic acid catalyst,	*0.50% paraquinone dioxime, 0.02% mixed resides*
11. 03-04-008A: High performance lithium perchlorate based propellant for various applications: *71.4% lithium perchlorate, 28.5% copolymer of hexamethylene adipamide, 0.1% residue*	**12. 03-04-009A: High performance polymer rocket propellant based on potassium perchlorate:** *65.5% potassium perchlorate, 21.8% beta-caprolcatam pre-polymer, 12.3% N-acetyl caprolactam pre-polymer, 0.21% polymerization catalyst, 0.19% mixed impurities*
13. 03-04-010A: High Performance potassium perchlorate rocket propellant: *73.2% potassium perchlorate, 12.6% polyurethane compound binder, 12.1% aluminum, 2% copper chromite burn rate catalyst, 0.10% balanced*	**14. 03-04-011A: High Performance potassium perchlorate rocket propellant:** *76% potassium perchlorate, 14.5% Epoxy resin binder, 9.5% aluminum*
15. 03-04-012A: Super high Performance potassium perchlorate rocket propellant containing hydroxylamine perchlorate: *62% potassium perchlorate, 30.3% Thiokol LP-2 polysulfide binder, 4.77% hydroxylamine perchlorate, 1.9% p-quinone dioxime, 0.95% diphenyl guanidine, 0.08% mixed residues*	**16. 03-04-013A: Super high Performance flexible, hydroxylamine perchlorate rocket propellant:** *41.56% hydroxylamine perchlorate, 33.25% potassium perchlorate, 24.93% Paralax P-10 binder, 0.24% benzoyl peroxide, 0.02% balance*
17. 03-04-014A: High Performance rocket propellant utilizing hydrazine nitrate: *60% hydrazine nitrate, 25.6% methyl acrylate, 10.4% methyl methacrylate, 3.6% allyl diglycol carbonate, 0.4% tert-butyl peroxide*	**18. 03-04-015A: Specialty magnesium perchlorate semi-solid (gelled) rocket propellant:** *71.46% magnesium perchlorate, 22.99% unleaded gasoline, 3.72% lamp black, 1.81% aluminum naphthenate, 0.02% rounded balance*
19. 03-04-016A: High Performance potassium perchlorate rocket propellant: *73.2% potassium perchlorate, 12.6% polyurethane compound binder, 12.1% aluminum, 2% copper chromite burn rate catalyst, 0.10% balanced*	**20. 03-04-017A: High Performance nitronium perchlorate specialty rocket propellant:** *60% nitronium perchlorate, 30% polybutadiene, 10% metallic lithium*
21. 03-04-018A: High Performance nitronium perchlorate specialty rocket propellant (modified cure): *50% ammonium perchlorate, 25% polybutadiene, 25% metallic lithium*	**22. 03-04-019A: High Performance hydrazine nitrate rocket propellant:** *48% hydrazine nitrate, 32% beryllium hydride, 12% carboxy terminated polybutadiene, 4% dioctyl azelate, 4% mineral oil*
23. 03-04-020A: High Performance hydrazine nitrate rocket propellant: *40.46% hydrazine nitrate, 17.34% sodium borohydride, 17.34% epon 815 epoxy binder, 14.45% potassium nitrate, 10.4% red phosphorus, 0.01% residual balance*	**24. 03-04-021A: High Performance potassium perchlorate rocket propellant with nitrocellulose base:** *48.85% potassium perchlorate, 25.44% nitrocellulose, 20.35% triacetin, 5.08% butyl phthalyl butyl glycolate, 0.25% mixed balance*
25. 03-04-022A: High Performance aluminum hydride propellant with nitrocellulose base: *50% nitrocellulose, 29% aluminum hydride, 14% nitronium perchlorate, 7% polymeric dichlorostyrene*	**26. 03-04-023A: High Performance potassium perchlorate rocket propellant:** *74.55% potassium perchlorate, 24.85% silicone elastomer, 0.21% benzoyl peroxide, 0.39% mixed impurities*
27. 03-04-023B: High Performance potassium perchlorate rocket propellant: *69.58% sodium perchlorate, 29.82% silicone elastomer, 0.59% benzoyl peroxide, 0.01% mixed impurities*	**28. 03-04-023C: High Performance potassium perchlorate rocket propellant with infrared illumination:** *74.53% cesium perchlorate, 17.39% silicone gum, 7.45% aluminum perchlorate, 0.62% benzoyl peroxide, 0.01% balance*
29. 03-04-024A: High Performance potassium perchlorate rocket propellant: *59.76% potassium perchlorate, 24.9% alpha-caprolactam, 14.94% N-acetyl caprolactam, 0.39% sodium hydride catalyst, 0.01% residue*	**30. 03-04-025A: High performance thermally stable rocket propellant:** *38.51% barium nitrate, 26.45% cyanuric acid, 26.08% magnesium dust, 11% Teflon, 10.95% Viton A copolymer binder, 0.05% copper chromite burn catalyst*
31. 03-04-026A: Moderate performance potassium nitrate based rocket propellant: *75% potassium nitrate, 25% asphalt black*	

03-04-001A: High Performance military rocket propellant (M7 propellant):

Place 200 milliliters of water into a suitable beaker or similar container, equipped with motorized stirrer using plastic stir blades, add in ***273 grams of nitrocellulose*** (any nitrogen content will work, but 13 to 14% nitrogen content is recommended). Immediately thereafter, add in 400 milliliters of ethyl acetate, and then followed by ***177 grams of nitroglycerine***. Thereafter, begin to moderately stir of the mixture, and shortly thereafter, add in ***6 grams of Carbolac I***, and then stir the entire mixture for about 30 minutes at room temperature. After 30 minutes, add in ***39 grams of potassium perchlorate,*** followed by ***4.5 grams of ethyl centralite***, and then continue stirring the mixture for 30 minutes at room temperature. After 30 minutes, add in 300 milliliters of warm water, and then continue blend the mixture on low speed for 1 hour. Thereafter, pour the entire mixture onto a shallow pan with a high surface area and allow it to thoroughly dry until the smell of solvent (ethyl acetate) is gone. When the smell of ethyl acetate is gone, place the remaining contents of the pan, including any water, into a large clean beaker, and then add in 2000 milliliters of water, and then heat

the mixture with mild stirring to 50 Celsius for about 10 to 15 minutes. After 10 to 15 minutes, stop stirring and allow the mixture to stand at room temperature for several days to allow the insoluble mixture to settle. Thereafter, gravity filter (no vacuum filtration) to recover the insoluble solids. Afterwards, place the dry solids into a plastic bag and then add in ***100 milligrams of finely divided graphite***, and then gently shake the bag thoroughly to coat the solids with the graphite. Thereafter, remove the coated solids from the plastic bag, and then press them into any desirable rocket motor, engine, or mold under a mild pressure, and then cure the rocket motor or mold in an oven at 30 Celsius for 24 hours or so.

Note: various modifications to the preparation of M7 military propellant exist.

Burn rate: 0.6 inches per second at 1000 psi

Water resistance: Very good

Stability: Can be stored for many years.

Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9

Tendency to cake: None

Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.

Percentage: ***54.6% nitrocellulose, 35.4% nitroglycerine, 7.8% potassium perchlorate, 1.2% carbolac I, 0.90% ethyl centralite, 0.020% graphite, 0.080% moisture***

Classification: Deflagrating explosive (classified as propellant).

Use: Used to propel anti-tank munitions, for example, the US militaries "TOW" missile systems.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure should be preformed behind proper blast shielding. Inexperienced preparers should use only small quantities to begin with.

03-04-002A: High Performance military rocket propellant:

Into a standard mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place ***24 grams of ethyl acrylate-acrylic acid (95-5, copolymer binder),*** followed by ***5.2 grams of "UNOX 221" (cross linking agent),*** and then blend the mixture on high for about 30 minutes at room temperature. After 30 minutes, add in ***2.5 grams of carbon black***, followed by ***252.5 grams of HMX***, and then continue to thoroughly blend the mixture on high at room temperature for 30 minutes. After 30 minutes, add in ***101 grams of ammonium perchlorate*** and then continue to blend the mixture for about 30 minutes at room temperature. Once again, after 30 minutes, carefully add in ***122 grams of nitroglycerine***, and then continue to blend, but reduce speed to slow, and then gently continue blending for about 10 to 15 minutes at room temperature. Afterwards, the propellant is ready to be casted. To do so, it should be gently pressed into any desirable rocket motor, engine, mold, ect., using the usual techniques, and the resulting rocket motor or mold should then be cured for several days. Note: during the pressing, the rocket motor or mold should be vibrated to work out any air bubbles or pockets.

Note: various modifications to the preparation of this propellant exist.

Burn rate: 0.70 inches per second at 1000 psi

Water resistance: Very good

Stability: Can be stored for many years.

Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9

Tendency to cake: None

Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.

Percentage: ***49.7% HMX, 24% nitroglycerine, 19.9% ammonium perchlorate, 4.7% ethyl acrylate-acrylic acid copolymer, 1% UNOX 221 linking agent, 0.49% carbon black catalyst, 0.210% moisture***

Classification: Deflagrating explosive (classified as propellant).

Use: Used to propel anti-tank munitions.

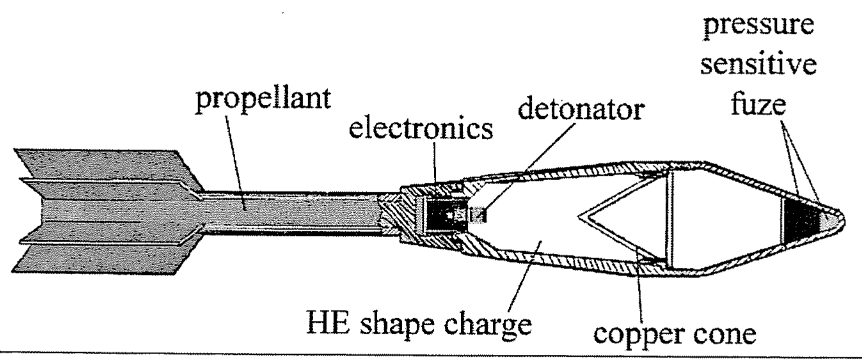
Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure should be preformed behind proper blast shielding. Inexperienced preparers should use only small quantities to begin with.

03-04-003A: High Performance CMDB rocket propellants 2 (composite modified Double Base propellants):

Into a suitable mixing bowl, mixer, blender, or similar container, place 290 milliliters of methylene chloride, followed by ***55.5 grams of triacetin***, followed by ***100 grams of finely divided aluminum powder***, followed by ***5.1 grams of 2-nitrodiphenylamine***, followed by ***55 grams of nitrocellulose***, followed by ***110 grams of ammonium perchlorate***, followed by slowly adding in ***173.5 grams of nitroglycerine***, followed by ***350 milligrams of lead 2-ethylhexoate***, and then blend the mixture on low speed using a typical motorized stirrer equipped with plastic stir blades until only about 10% of the methylene chloride remains. Thereafter, add in ***1.5 grams of 2,6-tolylene diisocyanate***, and then continue to blend the mixture on low speed for about 10 to 15 minutes to form a uniform mixture. Thereafter, the mixture is ready to be casted and cured. To do so, the propellant mixture should be pressed into any desirable rocket motor, engine, ect., under mild pressure, and then heated in an oven at 35 to 40 Celsius for 16 to 17 hours. Requires proper ignition composition.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: *34.6% nitroglycerine, 21.9% ammonium perchlorate, 19.9% aluminum, 11% triacetin, 10.9% nitrocellulose, 1% 2-nitrodiphenylamine, 0.35% impurities, 0.29% 2,6-tolylene diisocynate curative, 0.06% lead 2-ethylhexoate catalyst,*
Classification: Deflagrating explosive (classified as propellant).
Use: Widely used in high performance rockets for military and commercial use. Also used as a high performance gun propellant, and can be granulated using various techniques listed in the gun propellants section.

Anti-tank rocket propelled munition



03-04-003B: High Performance CMDB rocket propellants 2 (composite modified Double Base propellants):
Into a suitable mixing bowl, mixer, blender, or similar container, place 290 milliliters of methylene chloride, followed by *51.5 grams of di-n-propyl adipate*, followed by *100 grams of finely divided aluminum powder*, followed by *5 grams of 2-nitrodiphenylamine*, followed by *75 grams of nitrocellulose*, followed by *100 grams of ammonium perchlorate*, followed by slowly adding in *161 grams of nitroglycerine*, followed by *5 grams of resorcinol diacetate*, followed by *50 milligrams of ferric acetylacetonate*, and then blend the mixture on low speed using a typical motorized stirrer equipped with plastic stir blades until only about 10% of the methylene chloride remains. Thereafter, add in *1.9 grams of 2,6-tolylene diisocyanate*, and then continue to blend the mixture on low speed for about 10 to 15 minutes to form a uniform mixture. Thereafter, the mixture is ready to be casted and cured. To do so, the propellant mixture should be pressed into any desirable rocket motor, engine, ect., under mild pressure, and then heated in an oven at 48 Celsius for 4 days. Requires proper ignition composition.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: *32.2% nitroglycerine, 20% ammonium perchlorate, 20% aluminum, 15% nitrocellulose, 10.3% di-n-propyl adipate, 1% 2-nitrodiphenylamine, 1% resorcinol diacetate, 0.38% 2,6-tolylene diisocyante curative, 0.11% residue, 0.01% ferric acetylacetonate*
Classification: Deflagrating explosive (classified as propellant).
Use: Widely used in high performance rockets for military and commercial use. Also used as a high performance gun propellant, and can be granulated using various techniques listed in the gun propellants section.

03-04-004A: High Performance nitrocellulose/nitroglycerine based rocket propellant:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, *250 grams of nitrocellulose*, followed by *180 grams of nitroglycerin*, followed by *76.5 grams of triacetin*, and then followed by *2.5 grams of nitrodiphenylamine.* Thereafter, blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To use, simply pour, press and vibrate the mixture into any desired rocket motor, engine ect., in the usual means, and then cure the mixture in an oven at 60 Celsius

for 5 days. If desired, the mixture can be extruded from any desired die cast machine, to form any desired grain sizes for use as a high performance gun propellant.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Stable.
Percentage: *49.11% nitrocellulose, 35.36% nitroglycerine, 15.02% triacetin, 0.49% nitrodiphenylamine, 0.02% impurities*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets and missiles for the usual means, or used as a gun propellant.

03-04-005A: High Performance "hard, yet flexible" propellant utilizing hydroxylamine perchlorate:
Into a standard mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place *50 grams of a binder compound D.E.R. 332*, followed by *50 grams of Epon 812 resin*, followed by *400 grams of hydroxylamine perchlorate*, and then blend the mixture on high for about 10 to 15 minutes at room temperature to form a uniform mixture. After blending, the fluidized mixture is then ready for use. To use, it should be poured directly into your rocket motor, and the resulting rocket motor should then be vibrated for a few minutes to exclude air bubbles, and then cured in an oven at about 50 Celsius for about 24 hours or more.
Note: various modifications to the preparation of this propellant exist.

Burn rate: Average at 1000 psi
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: *80% hydroxylamine perchlorate, 10% D.E.R. 32 binder, 10% Epon 812 epoxy resin*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel a wide variety of missiles, rockets, and other projectiles.

03-04-005B: High Performance "hard, yet flexible" propellant utilizing hydroxylamine perchlorate (modified):
Into a standard mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place *50 grams of a binder compound D.E.R. 332*, followed by *50 grams of Epon 812 resin*, followed by *100 grams of aluminum powder of 325 mesh*, and then blend the mixture on low for about 30 minutes. Thereafter, add in *300 grams of hydroxylamine perchlorate*, and then blend the mixture on high for about 15 to 20 minutes at room temperature to form a uniform mixture. After blending, the fluidized mixture is then ready for use. To use, it should be poured directly into your rocket motor, and the resulting rocket motor should then be vibrated for a few minutes to exclude air bubbles, and then cured at room temperature for about 2 days.
Note: various modifications to the preparation of this propellant exist.

Burn rate: Average at 1000 psi
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: *60% hydroxylamine perchlorate, 20% aluminum, 10% D.E.R. 32 binder, 10% Epon 812 epoxy resin*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel a wide variety of missiles, rockets, and other projectiles.

03-04-006A: High Performance polymeric propellant utilizing guanidine perchlorate:
Into a suitable beaker or similar container, equipped with motorized stirrer, place *575 grams of guanidine perchlorate*, followed by *425 grams of anhydrous lithium perchlorate*, and then gently and slowly heat the mixture to 140 Celsius with gentle stirring. When the temperature reaches 140 Celsius, the mixture will melt and fuse into a molten mass. Once the mixture has melted, stir it for about 10 minutes at 140 Celsius, and then remove the heat source and allow the mixture to cool to room temperature. Note: before the molten mixture cools, pour it onto a shallow pan (made of plastic or steel), and then allow it to solidify—this aids in the ease of which to collect the solidified mass. Now, once the mixture solidifies and cools, collect it and then pulverize into small chunks or equivalent. Thereafter, into a clean beaker or suitable container, equipped with motorized stirrer, add *105 grams of acrylamide*, followed by *70 grams of ethylene glycol*, followed by *8 grams of N-methyl morpholine*, followed by the 1000 grams of the guanidine perchlorate/lithium perchlorate fused pieces previously prepared, and then heat the mixture to about 85 Celsius with rapid stirring.

When the mixtures temperature reaches about 85 Celsius, heat and stir at this temperature for about 30 minutes. After 30 minutes, add in *300 grams of standard mesh powdered aluminum*, and then continue to blend the mixture for about 30 minutes at 85 Celsius. After 30 minutes, add in *10 grams of succinic anhydride*, and continue to heat and stir the mixture for about 1 to 5 minutes. Note: once the succinic anhydride is added, polymerization will begin, so shortly thereafter, the mixture needs to be poured at 85 Celsius into the rocket motor. Note: in order for proper polymerization to proceed, your rocket motor or mold must be heated in an oven at 85 Celsius prior to pouring in the hot propellant mixture. Simply pre-heat your rocket motor to 85 Celsius, and then when your ready, pour in the heated propellant mixture and then cure the rocket motor or mold in the oven at 85 Celsius for several hours. Note: exact curing times may vary, so check the rocket motor every 30 minutes or so—when it's done, it will have a smooth and clear polymeric texture.
Burn rate: Very good at 1000 psi
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Very low.
Percentage: *38.5% guanidine perchlorate, 28.4% lithium perchlorate, 20% aluminum, 7% acrylamide, 4.6% ethylene glycol, 0.66% succinic anhydride plymerization catalyst, 0.53% N-methyl morpholine, 0.31% moisture and residue*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel a wide variety of missiles, rockets, and other projectiles.

03-04-007A: Moderate performance "rubber-like" propellant utilizing potassium perchlorate and polysulfide binder:

Into a standard mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place *97.5 grams of a polysulfide binder compound* sold as Thiokol LP-2, followed by *7.5 grams of lead dioxide*, followed by *7.5 grams of dibutyl phthalate*, followed by *1.75 grams of stearic acid*, and then blend the mixture on high speed for about 5 minutes. After 5 minutes, add in *300 grams of potassium perchlorate*, followed by *50 grams of ammonium perchlorate*, followed by *36 grams of furfuryl alcohol*, and then continue to blend the mixture on high speed for about 5 to 10 minutes to form a uniform mix. After blending, the fluidized mixture is then ready for use. To use, it should be poured and vibrated directly into your rocket motor, and then cured at room temperature for about 2 days.
Burn rate: Average at 1000 psi
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: None.
Percentage: *59.9% potassium perchlorate, 19.4% polysulfide binder, 9.9% ammonium perchlorate, 7.1% furfuryl alcohol plasticizer, 1.4% lead dioxide vulcanizing agent, 1.4% dibutyl phthalate dispersion medium, 0.56% mixed residues, 0.34% stearic acid catalyst*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel a wide variety of low velocity missiles especially of the wire-guided type.

03-04-007B: Moderate performance "rubber-like" propellant utilizing potassium perchlorate and polysulfide binder (modified):

Into a standard mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place *115 grams of a polysulfide binder compound* sold as Thiokol LP-2, followed by *2.5 grams of paraquinone dioxime*, followed by *3.4 grams of stearic acid*, followed by *6.5 grams of zinc oxide*, and then blend the mixture on high speed for about 5 minutes. After 5 minutes, add in *250 grams of potassium perchlorate*, followed by *85 grams of ammonium perchlorate*, followed by *37.5 grams of furfuryl alcohol*, and then continue to blend the mixture on high speed for about 5 to 10 minutes to form a uniform mix. After blending, the fluidized mixture is then ready for use. To use, it should be poured and vibrated directly into your rocket motor, and then cured in an oven at 65 Celsius for several hours.
Burn rate: Average at 1000 psi
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: *50% potassium perchlorate, 23% polysulfide binder, 17% ammonium perchlorate, 7.5% furfuryl alcohol plasticizer, 1.3% zinc oxide, 0.68% stearic acid catalyst, 0.50% paraquinone dioxime, 0.02% mixed resides*
Classification: Deflagrating explosive (classified as propellant).

Use: Can be used to propel a wide variety of low velocity missiles especially of the wire-guided type.

03-04-008A: High performance lithium perchlorate based propellant for various applications:

Into a suitable flask, equipped with nitrogen purge adapter (for excluding air and moisture), fitted with oil bubbler and nitrogen gas inlet tube, and motorized stirrer utilizing plastic stir blades, place *500 grams of anhydrous lithium perchlorate*, followed by *200 grams of a copolymer of hexamethylene adipamide and beta-aminocaproic acid*, and then slowly and gently heat the flask to 225 Celsius and heat at this temperature until a molten mixture results. Note: during the heating process, maintain a dry nitrogen atmosphere, by passing dry nitrogen gas into the flask. When a molten mixture is achieved, the propellant composition if ready to be casted. To do so, it needs to be poured, and vibrated into any desirable rocket motor, engine, mold, rocket cavity, ect., while the propellant mixture is in the molten state, and then allow the munition to cool at room temperature to facilitate re-solidification.
Burn rate: Average.
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Low.
Percentage: *71.4% lithium perchlorate, 28.5% copolymer of hexamethylene adipamide, 0.1% residue*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rocket assisted take-off munitions for aircraft, and in rocket assisted projectiles for artillery shells and the like.

03-04-009A: High performance polymer rocket propellant based on potassium perchlorate:

Into a suitable beaker or similar heat resistant container, equipped with motorized stirrer, place *100 grams of beta-caprolactam*, followed by *1 gram of sodium hydride*, followed by *56.5 grams of N-acetyl caprolactam*, followed by *300 grams of potassium perchlorate*, and then heat the contents to about 160 Celsius. While the temperature is raised to 160 Celsius, gently blend the dry mixture. When the temperature of the mixture reaches about 160 Celsius, it will become fluidized, and needs to be rapidly stirred for about 1 to 3 minutes. Immediately thereafter, the fluidized mixture needs to be poured and vibrated into any desirable rocket motor, engine, ect., before the mixture begins to polymerize. After the casting process, the munitions should be cured and allowed to cool for 12 to 24 hours. Requires standard ignition composition.
Burn rate: Average.
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Will explode if ignited when confined.
Percentage: *65.5% potassium perchlorate, 21.8% beta-caprolcatam pre-polymer, 12.3% N-acetyl caprolactam pre-polymer, 0.21% polymerization catalyst, 0.19% mixed impurities*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in general-purpose rockets and missiles, and for rocket assisted take-off munitions for aircraft.

03-04-010A: High Performance potassium perchlorate rocket propellant:

This procedure is identical to 03-03-012A, but the ammonium perchlorate is simply replaced with potassium perchlorate. Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blades, place *190 grams of potassium perchlorate*, followed by *50 grams of finely powdered aluminum* of the usual mesh, and then followed by *10 grams of copper chromite*. Immediately thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture on high speed to form a dough. Thereafter, place the dough onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill, filled with Teflon coated steel shot of the usual weight and diameter, and then tumble the mixture at 100 RPM or so for about 30 minutes to form a uniform powder. Now, into a clean mixing bowl, blender, ect., equipped with motorized stirrer in the usual means, place the uniform tumbled mixture, followed by *62.5 grams of a unhardened polyurethane compound* (commercially available), followed by *172.5 grams of potassium perchlorate*, followed by *10 grams of finely powdered aluminum*, and then blend the mixture on high speed for about 15 to 20 minutes to form a uniform fluidized mass. Thereafter, the mixture is ready for use. To use, the fluidized mass needs to be poured and pressed into any desirable rocket motor, engine, mold, ect., under the usual conditions, and the resulting engine or mold should be cured at room temperature, or at temperatures rising from 50 to 80 Celsius for several hours or for several days. Should be ignited using a black powder charge or equivalent ignition composition.
Burn rate: 0.30 to 0.35 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ½

Tendency to cake: None
Explosive ability: May explode under severe conditions only.
Percentage: ***73.2% potassium perchlorate, 12.6% polyurethane compound binder, 12.1% aluminum, 2% copper chromite burn rate catalyst, 0.10% balanced***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-04-011A: High Performance potassium perchlorate rocket propellant:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***380 grams of potassium perchlorate***, followed by ***47.5 grams of powdered aluminum***, and then followed by ***72.5 grams of any epoxy resin or Armstrong Resin E-301-14***, and then tumble the mixture at 150 to 200 RPM for about 30 to 40 minutes. Thereafter, the mixture is ready for use. To use, press the powdered mixture into any desirable rocket motor, engine, mold, ect., under a pressure of 15000 psi, and then cure the munitions in an oven at 170 to 200 Celsius. The rocket propellant can be fired using any desirable exploding bridge wire, or black powder charge in the normal fashion.
Burn rate: 0.5 to 0.6 inches per second at 600 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: May explode under severe conditions only.
Percentage: ***76% potassium perchlorate, 14.5% Epoxy resin binder, 9.5% aluminum***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance military and commercial rockets.

03-04-012A: Super high Performance potassium perchlorate rocket propellant containing hydroxylamine perchlorate:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***159 grams of Thiokol LP-2 polysulfide binder***, followed by ***227.5 grams of potassium perchlorate of 100 mesh***, followed by ***97.5 grams of potassium perchlorate of 325 mesh,*** followed by ***10 grams of para-quinone dioxime,*** followed by ***5 grams of diphenyl guanidine,*** and then followed by ***25 grams of hydroxylamine perchlorate***, and then tumble the mixture at 200 to 300 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, press the tacky mass into any desirable rocket motor, engine, mold, ect., under pressures ranging from 1500 to 3000 psi, in the usual manner, and then cure the munitions in an oven at 85 Celsius for 18 hours. The rocket propellant can be fired using any desirable ignition composition.
Burn rate: Super fast. 1 inch per second at 2000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10 (based on combustion).
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: May explode under severe conditions only.
Percentage: ***62% potassium perchlorate, 30.3% Thiokol LP-2 polysulfide binder, 4.77% hydroxylamine perchlorate, 1.9% p-quinone dioxime, 0.95% diphenyl guanidine, 0.08% mixed residues***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance military and commercial rockets and other devices for propulsion of heavy cargos.

03-04-013A: Super high Performance flexible, hydroxylamine perchlorate rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***150 grams of Paraplex P-10 binder***, followed by ***250 grams of hydroxylamine perchlorate of 200 mesh***, and then followed by ***200 grams of potassium perchlorate of average mesh,*** and then rapidly and thoroughly blend the mixture for about 5 to 10 minutes to form a uniform mixture. Note: the Paralax P-10 may even begin to polymerize at room temperature so take note. After the 5 to 10 minute blending period, add in ***1.5 grams of benzoyl peroxide***, and then briefly, yet thoroughly, blend the mixture on rapid speed for about 30 seconds to 1 minute. Thereafter, immediately pour, press, and vibrate the mixture into any desirable rocket motor, engine, ect., and then allow the mixture to cure at room temperature for several days or more. The rocket propellant can be fired using any desirable ignition composition.
Burn rate: Super fast. 1 inch per second at 2000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10 (based on combustion).
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: May explode under severe conditions only.

Percentage: ***41.56% hydroxylamine perchlorate, 33.25% potassium perchlorate, 24.93% Paralax P-10 binder, 0.24% benzoyl peroxide, 0.02% balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance military and commercial rockets and other devices for propulsion of heavy cargos. Can also be used in super fast short-range rockets.

03-04-014A: High Performance rocket propellant utilizing hydrazine nitrate:
Into a suitable empty ball mill, place ***128 grams of methyl acrylate,*** followed by ***18 grams of allyl diglycol carbonate,*** followed by ***52 grams of methyl methacrylate,*** and then tumble the mixture at 150 to 500 RPM for abut 30 minutes. Thereafter, add in ***300 grams of hydrazine nitrate,*** followed by 150 grams of steel shot of 2 to 3 millimeters in diameter, and then continue to tumble the mixture at 100 RPM for about 15 to 20 minutes to form a uniform mixture. Thereafter, place the tumbled mixture into a suitable beaker, or similar container, equipped with motorized stirrer, and then add in ***2 grams of tert-butyl peroxide,*** and then moderately blend the mixture for about 10 to 15 minutes at room temperature. Thereafter the mixture is ready for use. To use, pour and press the mixture into any desirable rocket motor, engine, ect., and then allow the mixture to cure at room temperature for several days or more. Heating the munitions in an oven at 50 to 100 Celsius may speed up the process, but small samples should be heated at various temperatures to test for heat sensitivity prior to committing to a full munition. The rocket propellant can be fired using any desirable ignition composition.
Burn rate: 0.1 to 0.2 inches per second at 1000 psi (actual burn rates may vary dependant on moisture).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on combustion).
Ease of ignition (1 to 10): 8
Tendency to cake: None
Explosive ability: May explode under severe conditions only.
Percentage: ***60% hydrazine nitrate, 25.6% methyl acrylate, 10.4% methyl methacrylate, 3.6% allyl diglycol carbonate, 0.4% tert-butyl peroxide***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in high performance military and commercial rockets for the usual purposes.

03-04-015A: Specialty magnesium perchlorate semi-solid (gelled) rocket propellant:
Into a suitable beaker of similar container, equipped with motorized stirrer, place ***22 grams of aluminum naphthenate*** (containing 7.55% aluminum by weight), followed by ***278 grams of regular unleaded gasoline.*** Thereafter, stir the mixture for about 10 to 15 minutes to form a gel. Thereafter, add in ***45 grams of lamp black,*** and then followed by ***864 grams of anhydrous magnesium perchlorate***, and then blend the mixture for about 20 to 30 minutes. Thereafter, the tacky gel is ready for use. To do so, it simply needs to be pressed into any desirable rocket motor, engine, mold, ect, in the usual fashion. The gelled propellant mixture can be ignited using any suitable means. Note: test the bun rate using a small sample before committing to a rocket munition for safety—stories of rocket motors exploding without warning have been reported, so use caution.
Burn rate: Burns smoothly.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9 (based on rate of combustion)
Ease of ignition (1 to 10): 6 ¾ (based on black powder ignition).
Tendency to cake: None
Explosive ability: Normally none. Has been known to explode.
Percentage: ***71.46% magnesium perchlorate, 22.99% unleaded gasoline, 3.72% lampblack, 1.81% aluminum naphthenate, 0.02% rounded balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel rockets and missiles. Can also be used as a gas generator.

03-04-016A: High Performance potassium perchlorate rocket propellant:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blades, place ***190 grams of potassium perchlorate***, followed by ***50 grams of finely powdered aluminum*** of the usual mesh, and then followed by ***10 grams of copper chromite***. Immediately thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture on high speed to form a dough. Thereafter, place the dough onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill, filled with Teflon coated steel shot of the usual weight and diameter, and then tumble the mixture at 100 RPM or so for about 30 minutes to form a uniform powder. Now, into a clean mixing bowl, blender, ect., equipped with motorized stirrer in the usual means, place the uniform tumbled mixture, followed by ***62.5 grams of a unhardened polyurethane compound*** (commercially available), followed by ***172.5 grams of ammonium perchlorate***, followed by ***10 grams of finely powdered aluminum***, and then blend the mixture on high speed for about 15 to 20 minutes to form a uniform fluidized mass. Thereafter, the mixture is ready for use. To use, the fluidized mass needs to be poured and pressed into any desirable rocket motor, engine, mold, ect., under the usual conditions,

and the resulting engine or mold should be cured at room temperature, or at temperatures ranging from 50 to 80 Celsius for several hours or for several days. Should be ignited using a black powder charge or equivalent ignition composition.
Burn rate: 8 millimeters per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: May explode under sever conditions only.
Percentage: ***73.2% potassium perchlorate, 12.6% polyurethane compound binder, 12.1% aluminum, 2% copper chromite burn rate catalyst, 0.10% balanced***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-04-017A: High Performance nitronium perchlorate specialty rocket propellant:
Into a special ball mill, equipped with inert gas inlet, and cooling apparatus, filled with 150 grams of Teflon coated steel shot, place ***150 grams of polybutadiene*** having a molecular weight of 3,000 and a viscosity of 300 poises, followed by ***50 grams of metallic lithium*** of 200 microns, and then tumble the mixture at 100 to 150 RPM for about 1 under. Note: the mixing should be kept under inert atmosphere to exclude moisture and the ball mill should be kept at a temperature of –40 Celsius. After the lithium reacts with the binder, add in ***300 grams of nitronium perchlorate*** of 1000 microns, and then continue to tumble the mixture at average RPM for about 1 hour at –40 Celsius under an inert atmosphere. Thereafter, the mixture is ready. To use, press the mixture into any desirable rocket motor, engine, ect., in the usual way, and then cure the munitions at room temperature for 24 hours.
Burn rate: 8 millimeters per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: May explode under sever conditions only.
Percentage: ***60% nitronium perchlorate, 30% polybutadiene, 10% metallic lithium***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-04-018A: High Performance nitronium perchlorate specialty rocket propellant (modified cure):
Into a special ball mill, equipped with inert gas inlet, and cooling apparatus, filled with 150 grams of Teflon coated steel shot, place ***125 grams of polybutadiene*** having a minimum of 0.4 milliequivalent of hydroxyl groups, followed by ***125 grams of metallic lithium*** of 200 microns, and then tumble the mixture at 100 to 150 RPM for about 1 hour. Note: the mixing should be kept under inert atmosphere to exclude moisture and the ball mill should be kept at a temperature of –40 Celsius. After the lithium reacts with the binder, add in ***250 grams of nitronium perchlorate*** of 1000 microns, and then continue to tumble the mixture at average RPM for about 1 hour at –40 Celsius under an inert atmosphere. Thereafter, the mixture is ready. To use, press the mixture into any desirable rocket motor, engine, ect., in the usual way, and then cure the munitions at 50 Celsius for 3 hours.
Burn rate: 8 millimeters per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None
Explosive ability: May explode under severe conditions only.
Percentage: ***50% ammonium perchlorate, 25% polybutadiene, 25% metallic lithium***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for multiple uses.

03-04-019A: High Performance hydrazine nitrate rocket propellant:
Into a suitable beaker or similar container, place ***600 grams of hydrazine nitrate***, and then gently heat the mixture until it melts. Thereafter, add in ***400 grams of beryllium hydride***, and then blend the mixture, using a motorized stirrer, for about 1 hour. Thereafter, place 800 grams of the mixture into a clean beaker, and then allow it cool to room temperature. Thereafter, add in ***120 grams of carboxy terminated polybutadiene***, followed by ***40 grams of dioctly azelate***, and then followed by ***40 grams of mineral oil.*** Thereafter, blend the mixture for about 1 hour. Now, place the mixture into a vacuum apparatus, and apply a mild vacuum to remove any dissolved gasses. Thereafter, place the mixture into a large container (container must be at least 4 times the volume of the propellant), and then allow the mixture to cure for 7 days. Note: during this time, the mixture will expand. Thereafter, place the

mixture into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the tumbled mixture needs to be pressed under high pressure into any desired rocket motor, engine, ect., at about 25,000 psi. Use a standard ignition composition for proper burn.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 7+
Tendency to cake: None
Explosive ability: May explode under severe conditions only.
Percentage: ***48% hydrazine nitrate, 32% beryllium hydride, 12% carboxy terminated polybutadiene, 4% dioctyl azelate, 4% mineral oil***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-04-020A: High Performance hydrazine nitrate rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place 350 milliliters of acetone, and then add in ***700 grams of hydrazine nitrate***, followed by ***300 grams of sodium borohydride***, and then followed by ***180 grams of red phosphorus***. Thereafter, blend the mixture on moderate speed for about 1 hour in the absence of air. Thereafter, place the mixture into a vacuum and remove the solvent. Thereafter, place the mixture into a clean mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***250 grams of potassium nitrate***, and then followed by ***300 grams of epon 815 epoxy binder*** or any similar liquid binder. Thereafter, blend the mixture on moderate speed for about 45 minutes in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at moderate temperature or at room temperature. A standard ignition composition can be used for proper burn.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None
Explosive ability: May explode under severe conditions only.
Percentage: ***40.46% hydrazine nitrate, 17.34% sodium borohydride, 17.34% epon 815 epoxy binder, 14.45% potassium nitrate, 10.4% red phosphorus, 0.01% residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-04-021A: High Performance potassium perchlorate rocket propellant with nitrocellulose base:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***200 grams of triacetin***, followed by ***50 grams of butyl phthalyl butyl glycolate***, followed by ***250 grams of nitrocellulose (average nitrogen content)***, and then followed by ***2.5 grams of lecithin***. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a nice slurry. Thereafter, add in ***480 grams of potassium perchlorate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture into a vacuum apparatus, and de-gas the mixture under vacuum. Thereafter, the mixture is ready for use. To use, the mixture needs to be poured, pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at 70 Celsius for about 2 days. A standard ignition composition can be used for proper burn.
Burn rate: 0.21 inches per second at 500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***48.85% potassium perchlorate, 25.44% nitrocellulose, 20.35% triacetin, 5.08% butyl phthalyl butyl glycolate, 0.25% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-04-022A: High Performance aluminum hydride propellant with nitrocellulose base:
Into a suitable ball mill place 50 milliliters of ethyl acetate, and the add in ***200 grams of nitrocellulose*** of average nitrogen content, and then tumble the mixture on moderate speed for about 15 minutes. Thereafter, place this nitrocellulose mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***116 grams of aluminum hydride***, and then add in ***56 grams of***

nitronium perchlorate. Finally, add in ***28 grams of polymeric dichlorostyrene***, and the blend the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed and vibrated into any desired rocket motor, or engine, in the usual manner, and then cured in an oven at moderate temperature for about 3 days. A standard ignition composition can be used for proper burn.
Burn rate: 0.19 to 0.22 inches per second at 500 and 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***50% nitrocellulose, 29% aluminum hydride, 14% nitronium perchlorate, 7% polymeric dichlorostyrene***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in military and commercial rockets and missiles for the usual uses.

03-04-023A: High Performance potassium perchlorate rocket propellant:
Into a suitable ball mill, or similar rotating device, place ***100 grams of a silicone elastomer*** composed of 90 mol percent dimethyl dichlorosilane and 10 mol percent of diphenyl dichlorosilane), followed by ***300 grams of potassium perchlorate***, and then followed by ***2.4 grams of benzoyl peroxide***. Thereafter, tumble or rotate the mixture on high RPM for about 3 hours at room temperature. Thereafter, place the milled mixture into any desired rocket motor, and then place the motor into an oven at heat to 120 Celsius for about 2 hours. Thereafter, heat the mixture to 200 Celsius for about 14 hours, making sure to vibrate the motor every so often to remove air-bubbles and the like. After the heating the period, the rocket propellant should be set and hard. Thereafter, the motor is ready to use. To use, the motor needs to be primed with a high temperature ignition composition.
Burn rate: 0.20 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 5 (ignition temperature: 260 Celsius+)
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***74.55% potassium perchlorate, 24.85% silicone elastomer, 0.21% benzoyl peroxide, 0.39% mixed impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets and missiles.

03-04-023B: High Performance potassium perchlorate rocket propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***150 grams of dimethyl polysiloxane elastomer*** (having a viscosity of 10,000 centipoises), followed by ***350 grams of sodium perchlorate***, and then followed by ***3 grams of benzoyl peroxide***. Thereafter, blend the mixture with high agitation for about 15 minutes. Thereafter, press the mixture under high pressure into any desired rocket motor, and then place the motor into an oven at heat to 120 Celsius for about 2 hours. Thereafter, heat the mixture to 200 Celsius for about 14 hours, making sure to vibrate the motor every so often to remove air-bubbles and the like. After the heating the period, the rocket propellant should be set and hard. Thereafter, the motor is ready to use. To use, the motor needs to be primed with a high temperature ignition composition.
Burn rate: 0.20 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 5 (ignition temperature: 260 Celsius+)
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***69.58% sodium perchlorate, 29.82% silicone elastomer, 0.59% benzoyl peroxide, 0.01% mixed impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets and missiles.

03-04-023C: High Performance potassium perchlorate rocket propellant with infrared illumination:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***70 grams of silicone gum*** (having a hydrocarbon groups composed of methyl groups), followed by ***30 grams of powdered aluminum perchlorate*** (anhydrous), followed by ***300 grams of cesium perchlorate***, and then followed by ***2.5 grams of benzoyl peroxide***. Thereafter, blend the mixture with high agitation for about 15 minutes. Thereafter, press the mixture under high pressure into any desired rocket motor, and then place the motor into an oven at heat to 120 Celsius for about 2 hours. Thereafter, heat the mixture to 200 Celsius for about 14 hours, making sure to vibrate the motor every so often to remove air-bubbles and the like. After the heating the period, the rocket propellant should be set and hard. Thereafter, the motor is ready to use. To use, the motor needs to be primed with a high temperature ignition composition.

Burn rate: 0.20 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 5 (ignition temperature: 260 Celsius+)
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***74.53% cesium perchlorate, 17.39% silicone gum, 7.45% aluminum perchlorate, 0.62% benzoyl peroxide, 0.01% balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets and missiles for generating an infrared trail for any desired means.

03-04-024A: High Performance potassium perchlorate rocket propellant:
Into an empty ball mill, or similar rotating device, place ***125 grams of alpha-caprolactum***, followed by ***2 grams of sodium hydride***, followed by ***75 grams of N-acetyl caprolactam***, and then followed by ***300 grams of potassium perchlorate***. Thereafter, tumble or rotate the mixture at room temperature for about 1 hour to form a uniform powder. Note; make sure to carryout the operation in the absence of moisture. After the milling process, press the powder into any desirable rocket motor, mold, engine, ect., under high-pressure, in the usual manner, and then place the munitions into an oven and heat to about 160 Celsius. Heat the mixture for about 10 minutes at said temperature, and vibrate the mixture periodically during the short heating process. Thereafter, remove the heat source, and allow the engine to cool. Thereafter, the rocket motor is ready for firing. Use a standard ignition composition for proper burn.
Burn rate: 0.15 to 0.19 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7+
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***59.76% potassium perchlorate, 24.9% alpha-caprolactam, 14.94% N-acetyl caprolactam, 0.39% sodium hydride catalyst, 0.01% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rockets.

03-04-025A: High performance thermally stable rocket propellant:
Into a ball mill, or similar rotating device, containing 400 grams of Teflon coated steel shot, place ***130.4 grams of magnesium dust***, followed by ***385.1 grams of anhydrous barium nitrate***, followed by ***264.5 grams of cyanuric acid***, and then tumble the mixture at room temperature for about 1 hour. Thereafter, separate the mixture from the steel shot using any desired screen, and the place the mixture into a suitable mixing bowl, equipped with motorized stirrer. Thereafter, add in 250 milliliters of acetone, followed by ***109.5 grams of Viton A copolymer binder***, followed by ***110 grams of Teflon powder***, and then followed by ***500 milligrams of copper chromite***, and then blend the mixture at 60 Celsius until the bulk of the acetone evaporates. Thereafter, the mixture is ready for use. To use the mixture needs to be pressed into any desirable rocket motor, mold, engine, ect., under high-pressure, in the usual manner, and then place the munitions into an oven and heat to about 140 to 160 Celsius for about 10 to 15 minutes. Note: vibrate the munitions periodically during the short heating process. Thereafter, remove the heat source, and allow the munitions to cool. Thereafter, the rocket motor is ready for firing. Use a standard ignition composition for proper burn.
Burn rate: Not calculated.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): unknown
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***38.51% barium nitrate, 26.45% cyanuric acid, 26.08% magnesium dust, 11% Teflon, 10.95% Viton A copolymer binder, 0.05% copper chromite burn catalyst***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in specialty rocket systems.

03-04-026A: Moderate performance potassium nitrate based rocket propellant:
Into a ball mill, or vertical mixer, containing 250 grams of Teflon coated steel shot, place ***375 grams of potassium nitrate***, and then followed by ***125 grams of finely ground asphalt black***. Thereafter, tumble or rotate the mixture at 500 RPM for about 2 hours.

Thereafter, the mixture is ready for use. To use, the mixture needs to be heated to about 250 Celsius, and then pressed into any desirable rocket motor, mold, engine, ect., under a pressure of about 15,000 psi, in the usual manner. Thereafter, the munitions should be allowed to cool to room temperature for about 12 hours minimum. Thereafter, the rocket motor is ready for firing. Use a standard ignition composition for proper burn.

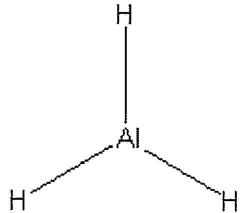
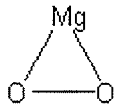
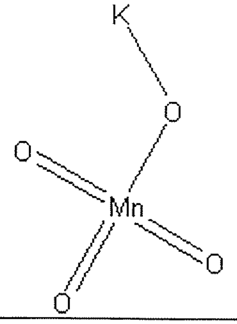
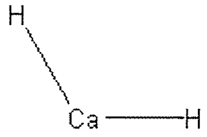
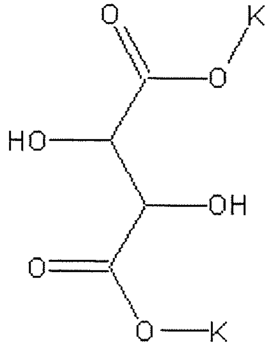
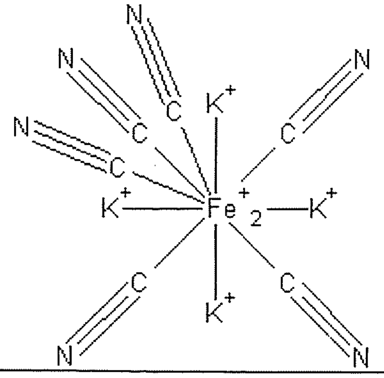
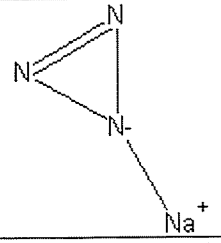
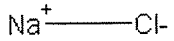
Burn rate: 0.1 inches per second at 1000 psi (estimated).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 6
Tendency to cake: None
Explosive ability: Stable.
Percentage: *75% potassium nitrate, 25% asphalt black*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets for fireworks or commercial use.

4. Non-Black Powder Gun Propellants

Section 1: Ammonium Nitrate Containing

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**

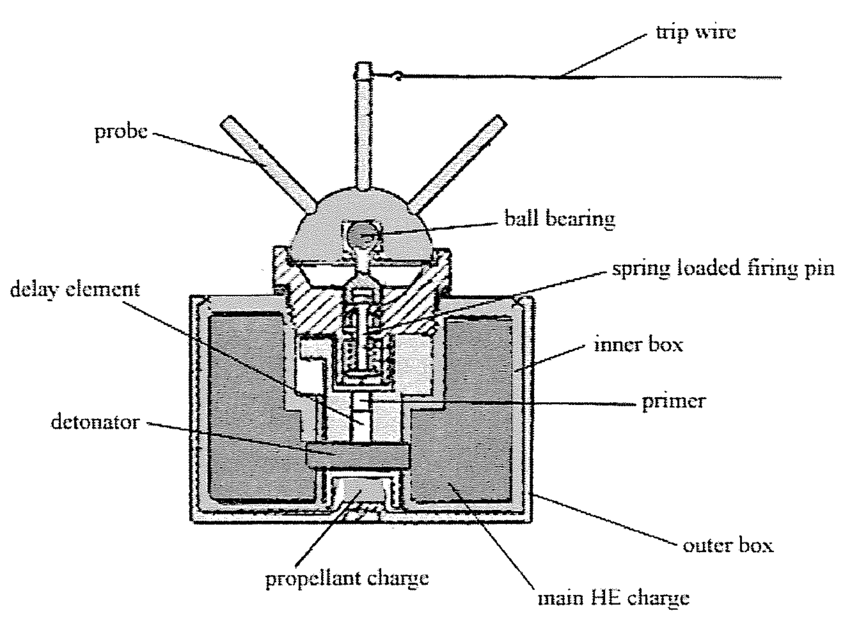
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate**
	$[CH_3(CH_2)_{16}COO]_3Al$
	Forms hard white to crystalline masses, which polymerize to a plastic like mass upon heating. When freshly prepared, the salt is soluble in alcohol, and slightly in water, but reverts to polymer forms upon standing which is insoluble in water and most organic solvents. Is prepared by heating aluminum hydroxide with stearic acid in solvent.
67. Aluminum Hydride	**68. Magnesium Peroxide**
	
Aluminum hydride forms colorless crystals that probably exist as a polymerized solid containing diethyl ether of crystallization that cannot be removed. The hydride is relatively stable at room temperature, but reacts with water with some violence. The salt is prepared by reacting ether solutions of aluminum chloride and lithium hydride.	Magnesium peroxide forms a white crystalline mass or powder. The salt is insoluble in water and most solvents. Magnesium peroxide is relatively unstable and begins to loose oxygen on standing in moist air.
69. Potassium Permanganate	**70. Calcium Hydride**
	
Potassium permanganate forms beautiful dark purple crystals that have a beautiful sheen. The salt is very stable in air, but begins to decompose when heated to 240 Celsius. The salt is soluble in water, and alcohol, but the latter it reacts with. Potassium permanganate is a powerful oxidizing salt, so users should use caution when working with this compound.	White to grayish powder or crystalline mass. The salt decomposes in contact with water and alcohol. The hydride can be stored in the absence of moisture for some time. Best prepared by heating the two elements together.
71. Potassium Tartrate	**72. Potassium Ferrocyanide**
	 N N N N C C C C K+ K+ Fe+2 K+ K+ C C N N
Forms white crystals, granules, or powder. The crystals readily absorb moisture forming a hemihydrate. The salt is soluble in water, but insoluble in alcohol and other common solvents.	Forms a trihydrate, which looses its water when heated to 100 Celsius. The salt is soluble in water, but relatively insoluble in the usual organic solvents. Keep out of contact with concentrated sulfuric acid to avoid the formation of the deadly hydrogen cyanide gas.
73. Sodium Azide	**74. Sodium Chloride**
	
Forms colorless crystals or a white powder or granules. The crystals break down into nitrogen and metallic sodium. The crystals are readily soluble in water, but relatively insoluble in most common solvents. Aqueous solutions should not be stored for long periods of time due to formation of hydrazoic acid. Sodium azide is highly toxic, so users should use caution. The salt is prepared by heating nitrous oxide with sodamide	Forms cubic crystals, or white granules or powder. Is capable of forming large beautiful cubic like crystals, some as big as basketballs. Sodium chloride is one of the most common salts in human civilization, and is a major source of chlorine and sodium salts. Its melting point is 804 Celsius.

- *High Performance Ammonium Nitrate Gun Propellants in this section* -

1. 04-01-001A: High Performance ammonium nitrate gunpowder: *60% ammonium nitrate, 17.8% charcoal, 10% sulfur, 10% sodium nitrate, 1.1% calcium carbonate, 0.90% urea, 0.150% calcium sulfate, 0.050% impurities*	**2. 04-01-002A: High Performance ammonium nitrate gunpowder:** *70% ammonium nitrate, 15% aluminum, 15% aluminum stearate*
3. 04-01-003A: High Performance ammonium nitrate gunpowder: *73.55% ammonium nitrate, 12.5% methyl iodide, 9.48% 1,3-butadiene, 3.16% 2-vinylpyridine, 0.62% sodium soap, 0.62% mercaptan blend, 0.037% potassium persulfate catalyst, 0.033% rounded balance*	**4. 04-01-004A: High Performance ammonium nitrate gunpowder:** *81.4% ammonium nitrate, 9.96% copolymer binder, 3.6% ammonium perchlorate, 1.97% triacetin, 1.76% melamine, 0.5% magnesium oxide, 0.3% mixed impurities, 0.3% zinc oxide, 0.21% GMF*
5. 04-01-005A: High performance gun propellant with catalyst accelerant: *52.2% ammonium nitrate, 33.3% magnesium (percentage can vary), 14.3% magnesium peroxide (percentage can vary), 0.2% potassium permanganate*	**6. 04-01-006A: High performance gun propellant with catalyst accelerant:** *82% ammonium nitrate, 10% potassium nitrate, 7% binder composition, 1% ammonium dichromate*
7. 04-01-007A: High performance ammonium nitrate gun propellant: *69.1% ammonium nitrate, 29.61% nitrocellulose, 1.28% diphenylamine, 0.01% mixed balance*	**8. 04-01-007B: High performance ammonium nitrate gun propellant (modified):** *55.8% ammonium nitrate, 40.93% nitrocellulose, 1.6% aluminum powder, 1.17% diphenylamine, 0.5% camphor*
9. 04-01-008A: Ammonium nitrate smokeless gun propellant: *65.23% ammonium nitrate, 20.07% magnesium powder, 9.83% nitrocellulose,4.41% aluminum powder, 0.44% diphenylamine, 0.02% graphite and mixed balance*	**10. 04-01-009A: Standard high performance ammonium nitrate gun propellant:** *46.3% ammonium nitrate, 19.7% nitroguanidine, 16.25% calcium hydride, 9.85% Teflon, 6.4% nitrocellulose, 1.47% diphenylamine, 0.03% mixed residual balance*
11. 04-01-010A: High performance ammonium nitrate smokeless powder: *50% nitrocellulose, 40% nitroglycerine, 4% barium tartrate, 2.5% Vaseline, 2.6% olive oil, 0.90% potassium tartrate, 0.1% mixed balance*	**12. 04-01-011A: High performance nitrocellulose gun propellant:** *59.7% ammonium nitrate, 19.9% nitrocellulose, 9.95% corn starch, 9.95% dinitrotoluene, 0.49% diphenylamine, 0.01% graphite and mixed residues*
13. 04-01-012A: Ammonium nitrate high performance gun propellant: *44.3% ammonium nitrate, 20.25% sodium benzoate, 12.65% potassium ferrocyanide, 9.49% barium nitrate, 6.32% potassium chlorate, 6.32% nitrocellulose, 0.63% lamp black, 0.04% graphite and mixed residues*	**14. 04-01-013A: High performance ammonium nitrate based gun propellant:** *51.36% ammonium nitrate, 27.39% nitrocellulose, 13.01% wheat flour, 6.16% sulfur, 2.05% sodium azide, 0.03% graphite and impurities*
15. 04-01-014A: High performance nitrate based gun propellant: *55.55% ammonium nitrate, 22.22% starch, 11.11% charcoal, 11.11% barium nitrate, 0.01% graphite and mixed impurities*	**16. 04-01-015A: High performance ammonium nitrate gun propellant with potassium picrate booster:** *52% ammonium nitrate, 25% potassium picrate, 20% sulfur, 3% soft wood charcoal*
17. 04-01-016A: High performance ammonium nitrate gun propellant: *49.8% ammonium nitrate, 17.24% nitrocellulose, 15.32% potassium nitrate, 10.53% graphite, 7.08% sodium hypophosphite, 0.03% mixed balance*	**18. 04-01-017A: High performance ammonium nitrate gun propellant:** *54.86% ammonium nitrate, 20% nitrocellulose, 19% dinitrotoluene, 4.4% dibutylphthalate, 1.5% diphenylamine, 0.24% graphite and mixed residue*
19. 04-01-018A: High performance ammonium nitrate gun propellant: *72.81% ammonium nitrate, 14.56% sulfur, 9.7% soft wood charcoal, 2.91% sodium chloride, 0.02% graphite and residual balance*	**20. 04-01-018B: High performance ammonium nitrate gun propellant:** *63.55% ammonium nitrate, 12.71% sulfur, 8.47% soft wood charcoal, 8.47% nitrocellulose, 4.23% barium nitrate, 2.54% sodium chloride, 0.03% graphite and mixed residual balance*

04-01-001A: High Performance ammonium nitrate gunpowder:
Into a ball mill or similar mixing drum, add ***600 grams of dry ammonium nitrate*, *100 grams of pure sulfur*, *178 grams of charcoal*, *100 grams of sodium nitrate*, *11 grams of calcium carbonate*, *9 grams of urea***, and then ***1.5 grams calcium sulfate***. Thereafter, pour in 200 milliliters of kerosene or naphtha, followed by 150 grams of Teflon coated steel shot of 5 millimeters in diameter, and then thoroughly blend the mixture for several hours at room temperature for about 150 RPM. After the blending operation, remove the mixture from the ball mill or mixing drum, and then spread it out on a shallow pan, and allow it to thoroughly air-dry. When the smell of solvent is no longer, you can crush the mixture into a powder, or pulverize it and then separate the various grain sizes using sieves in the usual manner. For maximum gunpowder effect, the grain sizes should be 1 to 2 millimeters in diameter. Note: If you have an extruding machine (like a pasta maker, where the pasta gets extruded into spaghetti like strands), place the mixture, right after the blending operation, into your extruding machine, and extrude the mixture into strands 1 to 2 millimeters in diameter by about 200 millimeters long. After the extruding process, cut the "spaghetti" strands into granules of 1 to 2 millimeters in size, and then allow the grains to cure until completely dry. To use the grains either way, simply pour them into any desirable cartridge casing. Use standard gun casing primers for initiation.
Burn rate: Fast.

Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Make cake on standing in moist environment.
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***60% ammonium nitrate, 17.8% charcoal, 10% sulfur, 10% sodium nitrate, 1.1% calcium carbonate, 0.90% urea, 0.150% calcium sulfate, 0.050% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Substitute for black powder in traditional muzzle loaded weapons, mortars, or cannons, and also in non-firearms weapons as in the following landmine.

Anti-personnel "bouncing betty" land mine	**Description:**
 trip wire probe ball bearing spring loaded firing pin delay element inner box primer detonator outer box propellant charge main HE charge	Bouncing betty type land mines are designed to propel into the air where they detonate. Because they detonate in the air, the fragmenting radius, and hence, casualty producing radius, is increased.

04-01-002A: High Performance ammonium nitrate gunpowder:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blades, place ***210 grams of absolutely dry ammonium nitrate***, followed by ***45 grams of finely powdered aluminum*** of the usual size or mesh, and then followed by ***45 grams of aluminum stearate***. Immediately thereafter, add in 150 milliliters of acetone, and then blend the mixture on high speed to form a dough. Thereafter, place the dough onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill, filled with Teflon coated steel shot of the usual weight and diameter, and then tumble the mixture at 150 RPM for about 30 minutes to form a uniform powder. Now, place this uniform powder into a suitable beaker or container, equipped with motorized stirrer, and then add in 150 milliliters of diethyl ether, and then blend the mixture for about 15 to 20 minutes to form a dough-like mass. Thereafter, you need to extrude the dough using an extruding machine (die cast machine) to form spaghetti like strands of any desired diameter in the usual manner. After the extruding process, cut the "spaghetti" strands into granules (small sections) of any desired length, and then allow the grains to cure until completely dry. Note: heating the grains at 40 to 50 Celsius in an oven mayor may not be used to speed up the curing process. Thereafter, the grains should be coated with graphite by gently shaking the grains in a plastic bag or similar container containing a small amount of powdered graphite. The grains can then be loosely placed into any desirable gun cartridge in the usual manner. Use a standard gun casing primer for initiation.
Burn rate: Rapid (based on ignition under confined conditions).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: Make cake on prolonged standing.
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***70% ammonium nitrate, 15% aluminum, 15% aluminum stearate***
Classification: Deflagrating explosive (classified as propellant).
Use: Substitute for black powder, smokeless, powder, or other high performance gun propellants.

04-01-003A: High Performance ammonium nitrate gunpowder:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing plastic stir blades, place ***25.8 grams of 1,3-butadiene***, followed by ***8.6 grams of 2-vinylpyridine***, followed by ***1.7 grams of pulverized sodium soap flakes***, followed by ***62 grams of distilled water***, followed by ***103 milligrams of potassium persulfate***, followed by ***1.7 grams of a mercaptan blend*** (composed of C12, C14, and C16 aliphatic mercaptans). Thereafter, blend the mixture for about 10 to 15 minutes to form a uniform liquid mixture. Thereafter, add in ***200 grams of ammonium nitrate***, followed by ***34 grams of methyl iodide***, and then briefly but vigorously blend the mixture for about 5 to 10 minutes. Thereafter, the pasty mass in ready to be cast, to do so, it needs to be pressed at 2000 psi into any desirable mold, and these molds need to be heated to 125 Celsius at 500 psi for about 15 to 20 minutes to harden the mixture. Thereafter, the pellets should be pulverized using the normal techniques, and the various grain sizes then separated by the desired sieves or screening. If desired, the pasty mass, prior to hardening, can be extruded using an extruding machine (die cast machine) to form spaghetti like strands of any desired diameter in the usual manner. After the extruding process, cut the "spaghetti" strands into granules (small sections) of any desired length, and then heat the grains to 125 Celsius under a pressure of 500 psi for 15 to 20 minutes. If desired, the grains can be coated with graphite by gently shaking the grains in a plastic bag or similar container containing a small amount of powdered graphite. The grains can then be loosely placed into any desirable gun cartridge in the usual manner. Use a standard gun casing primer for initiation.
Burn rate: Rapid (based on ignition under confined conditions). Burns slow when ignited in the open.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on gun firing).
Ease of ignition (1 to 10): 9 (based on gun firing).
Tendency to cake: Make cake on prolonged standing.
Explosive ability: Little to none.
Percentage: *73.55% ammonium nitrate, 12.5% methyl iodide, 9.48% 1,3-butadiene, 3.16% 2-vinylpyridine, 0.62% sodium soap, 0.62% mercaptan blend, 0.037% potassium persulfate catalyst, 0.033% rounded balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Substitute for smokeless powder, or other high performance gun propellants.

04-01-004A: High Performance ammonium nitrate gunpowder:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place 150 milliliters of cyclohexane or acetone, followed by ***49.8 grams of a copolymer of 1,3-butadiene-2-methyl-5-vinyl pyridine***, followed by ***8.8 grams of melamine***, followed by ***9.85 grams of triacetin***, followed by ***1.5 grams of Flexamine*** (65% diarylamine ketone and 35% N,N-diphenylparaphenylene diamine, followed by ***1.05 grams of GMF (paraquinone dioxime)***, followed by ***2.5 grams of magnesium oxide***, followed by ***1.5 grams of zinc oxide***, and then blend the mixture for about 15 minutes. Thereafter, add in ***407 grams of ammonium nitrate***, and then followed by ***18 grams of ammonium perchlorate***, and then blend the mixture until the bulk of the solvent has evaporated, and a pasty mass remains. Thereafter, the mixture is ready for use. To do so, extrude the dough-like material through any desirable die cast machine to form spaghetti like strands of any diameter and length under a hydraulic pressure of about 4000 to 5000 psi. After which, the spaghetti-like strands should be cut into individual equal lengths ranging from 5 to 10 milliliters in diameter. Thereafter the cut cyndrical grains should be cured in an oven at 76 to 85 Celsius for about 3 hours.
Burn rate: 2.4 inches per second at room temperature and 35,000 psi
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on gun firing).
Ease of ignition (1 to 10): 9 (based on gun firing).
Tendency to cake: Make cake on prolonged standing.
Explosive ability: Little to none.
Percentage: *81.4% ammonium nitrate, 9.96% copolymer binder, 3.6% ammonium perchlorate, 1.97% triacetin, 1.76% melamine, 0.5% magnesium oxide, 0.3% mixed impurities, 0.3% zinc oxide, 0.21% GMF*
Classification: Deflagrating explosive (classified as propellant).
Use: Substitute for smokeless powder, or other high performance gun propellants.

04-01-005A: High performance gun propellant with catalyst accelerant:
Into a suitable beaker or similar container, place 500 milliliters of warm water, and then add and dissolve 75 grams of potassium permanganate. Thereafter, add in ***365 grams of finely powdered magnesium metal***, and then stir the mixture for about 10 minutes. Thereafter, filter-off the magnesium, and then allow it to thoroughly dry on a shallow tray, no vacuum filtration. Now, into a clean beaker or similar container, place 400 milliliters of a 30% hydrogen peroxide solution, and then place the solution into an ice bath and chill to 0 Celsius. Thereafter, when its temperature reaches 0 Celsius, add in, in small portions, the dried coated magnesium particles, and then stir the mixture for about 1 minute. Thereafter, immediately filter-off the insoluble particles, and then vacuum dry or air-dry them. Finally, into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place the dried filtered-off particles, and then add in ***400 grams of highly dry ammonium nitrate***, followed by 150 milliliters of ether, and then blend the mixture until the bulk of the ether evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow the mass to thoroughly dry.

Thereafter, pulverize the mass, either thoroughly or moderately, depending on how big you wan the grain sizes. The various grain sizes can be separated suing screens or sieves, in the usual manner.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions.
Percentage: *52.2% ammonium nitrate, 33.3% magnesium (percentage can vary), 14.3% magnesium peroxide (percentage can vary), 0.2% potassium permanganate*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in riffles, field guns, cannons, ship guns, and other weapons. Note: this propellant should not be used in conventional firearms.

04-01-006A: High performance gun propellant with catalyst accelerant:
Into a suitable beaker, equipped with motorized stirrer, place 180 grams of 1,3-butadiene, followed by 33 grams of furnace black, followed by 8 grams of finely divided selenium metal, and then followed by 20 grams of 2-methyl-5-vinylpyeridine. Thereafter, place the mixture into an ice bath, and chill to about 5 Celsius, and then blend the mixture for about 1 hour at said temperature. Now, into a clean ball mill, equipped with 200 grams of Teflon coated steel shot, place ***330 grams of ammonium nitrate***, followed by ***40 grams of potassium nitrate***, and then followed by 1 milliliters of water. Thereafter, tumble the mixture at 65 Celsius for about 24 hours at moderate RPM. Thereafter, add in ***28 grams of the 1,3-butadiene polymer compound***, previously prepared, and then followed by ***4 grams of ammonium dichromate*** burn catalyst, and then continue to blend the mixture for about 1 hour at moderate speed. Thereafter, the mixture is ready for use. To use, the mixture needs to extruded from any desired die cast, preferably of 10 to 15 millimeters in diameter, under a pressure of 10,000 psi to form spaghetti like strands. These strands should then be cut into 5 millimeters length grains. Thereafter, the grains should be cured in an oven at 150 Fahrenheit for about 7 to 12 hours. Thereafter the grains can be loaded into any desired gun casing, shell-casing ect., in the usual manner.
Burn rate: Rapid.
Water resistance: Poor.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable to heat, light, and radiation.
Percentage: *82% ammonium nitrate, 10% potassium nitrate, 7% binder composition, 1% ammonium dichromate*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used field guns, cannons, ship guns, and other weapons.

04-01-007A: High performance ammonium nitrate gun propellant:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***350 grams of ammonium nitrate***, followed by ***150 grams of nitrocellulose*** of average nitrogen content, followed by 90 milliliters of acetone, and then followed by 18 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture on moderate speed for about 10 minutes. Thereafter add in ***6.5 grams of diphenylamine***, and then continue to blend the mixture on moderate speed for about 35 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded from any desired die cast, preferably of 5 to 10 millimeters in diameter, under a pressure of 10,000 psi to form spaghetti like strands. These strands should then be cut into 5 millimeters length grains. Thereafter, the grains should be cured in an oven at moderate temperature. Thereafter the grains can be loaded into any desired gun casing, shell-casing ect., in the usual manner. The cured grains can be glazed with graphite or any other similar material if desired.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *69.1% ammonium nitrate, 29.61% nitrocellulose, 1.28% diphenylamine, 0.01% mixed balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used field guns, cannons, ship guns, and other weapons.

04-01-007B: High performance ammonium nitrate gun propellant (modified):

Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***558 grams of ammonium nitrate***, followed by ***409.3 grams of nitrocellulose*** of average nitrogen content, followed by 160 milliliters of acetone, and then followed by 35 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture on moderate speed for about 10 minutes. Thereafter add in ***11.7 grams of diphenylamine***, followed by ***16 grams of aluminum powder***, and then followed by ***5 grams of camphor***. Thereafter, blend the mixture on moderate speed for about 35 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded from any desired die cast, preferably of 5 to 10 millimeters in diameter, under a pressure of 10,000 psi to form spaghetti like strands. These strands should then be cut into 5 millimeters length grains. Thereafter, the grains should be cured in an oven at moderate temperature. Thereafter the grains can be loaded into any desired gun casing, shell-casing ect., in the usual manner. The cured grains can be glazed with graphite or any other similar material if desired.

Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***55.8% ammonium nitrate, 40.93% nitrocellulose, 1.6% aluminum powder, 1.17% diphenylamine, 0.5% camphor.***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used field guns, cannons, ship guns, and other weapons.

04-01-008A: Ammonium nitrate smokeless gun propellant:

Into a large suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***325 grams of ammonium nitrate***, followed by ***100 grams of magnesium powder***, followed by 250 milliliters of 95% ethyl alcohol or denatured alcohol, and then allow the mixture to stand for about 5 minutes. Thereafter, blend the mixture for about 10 minutes, and then add in ***49 grams of nitrocellulose***, and then continue to blend the mixture for about 10 minutes on moderate speed. After 10 minutes of mixing time, add in ***22 grams of aluminum powder***, and then continue to blend the mixture for about 10 minutes on moderate speed. Thereafter, into a clean beaker or suitable container, add 150 milliliters of diethyl ether, and then add and dissolve ***2.2 grams of diphenylamine***. Thereafter, add this ether/diphenylamine solution to the bulk of the nitrocellulose mixture, and then continue to blend the mixture on moderate speed until the bulk of the solvents evaporate to leave behind a dough-like material. Now, extrude the dough-like material through any desirable die cast machine to form spaghetti like strands of any diameter and length under a hydraulic pressure of about 3000 to 4000 psi. After which, the spaghetti-like strands should be cut into individual equal lengths ranging from 5 to 10 milliliters in diameter. Thereafter the cut cyndrical grains should be cured in an oven at 50 Celsius for about 5 days. After 5 days, the cynidrical grains should be coated with graphite by shaking the grains in a plastic bag or similar container containing powdered graphite. Thereafter, the grains are ready for use. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation.

Burn rate: Rapid.
Chamber pressure: Moderate.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***65.23% ammonium nitrate, 20.07% magnesium powder, 9.83% nitrocellulose,4.41% aluminum powder, 0.44% diphenylamine, 0.02% graphite and mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Suitable for use in shotguns, and pistols.

04-01-009A: Standard high performance ammonium nitrate gun propellant:

Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***470 grams of ammonium nitrate***, followed by ***200 grams of nitroguanidine***, followed by ***165 grams of calcium hydride***, followed by ***15 grams of diphenylamine***, and then followed by 250 milliliters of hexane. Thereafter blend the mixture for about 30 minutes on moderate speed until a paste forms. Thereafter add in ***100 grams of finely divided Teflon,*** and then followed by ***65 grams of nitrocellulose.*** Thereafter, continue to blend the mixture for about 2 hours at room temperature in the absence of air. Thereafter, the mixture needs to be extruded through a die cast machine under pressure of 2500 to 3000 psi to form spaghetti-like strands. The strands can range from 6 to 12 inches in length, and the diameter should range from 2 to 5 millimeters in diameter. Thereafter, place the strands on a shallow tray and allow them to thoroughly air-dry in a dessicator or moisture free environment. Thereafter, cut the strands into pieces ranging from 3 to 8 millimeters in length, and then coat the grains with graphite using the usual means. Thereafter, the grains are ready for use. To use, the grains simply need to be placed loosely, into any desirable powder bag.

Burn rate: Rapid.
Chamber pressure: 75,000 psi (estimated).

Chamber pressure: High
Water resistance: Moderate.
Stability: Moderate.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***46.3% ammonium nitrate, 19.7% nitroguanidine, 16.25% calcium hydride, 9.85% Teflon, 6.4% nitrocellulose, 1.47% diphenylamine, 0.03% mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Used to propel heavy shells.

04-01-010A: High performance ammonium nitrate smokeless powder:

Into a suitable ball mill, filled with 500 grams of Teflon coated, light steel shot, place ***375 grams of ammonium nitrate***, followed by ***100 grams of sodium oxalate,*** followed by ***25 grams of nitrocellulose,*** and then followed by ***25 grams of calcium tartrate.*** Thereafter tumble the mixture at 300 RPM for about 1 hour. Thereafter, remove the steel shot using screens in the usual manner, and then place the tumbled mixture into any suitable mixing drum, bowl, ect., equipped with motorized stirrer, and then add in 150 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry. If desired, the grains can be used as a loose powder.

Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50% nitrocellulose, 40% nitroglycerine, 4% barium tartrate, 2.5Vaseline, 2.6% olive oil, 0.90% potassium tartrate, 0.1% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in shotgun or pistol ammo.

04-01-011A: High performance nitrocellulose gun propellant:

Into a suitable mixing bowl, vertical mixer, or similar container, equipped with motorized stirrer, place ***300 grams of ammonium nitrate,*** and then followed by ***100 grams of nitrocellulose.*** Thereafter, add in 150 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***50 grams of cornstarch***, followed by ***50 grams of dinitrotoluene*** (any suitable isomer), and then followed by ***2.5 grams of diphenylamine.*** Thereafter, add in 75 milliliters of ether, and then blend the mixture at room temperature for about 10 minutes. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture at this temperature for about 30 minutes. Note use a vacuum or proper ventilation as the ether will evaporate rapidly—extinguish all flames. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Once it has, the mixture is ready for use. To use, the mixture needs to extruded from any desired die cast machine to form spaghetti like strands ranging from 100 to 150 millimeters in length, by 1 to 2 millimeters in diameter. Thereafter these strands simply need to be cut into lengths ranging from 1 to 5 millimeters. The resulting grains should then be coated with a thin layer of graphite powder, and then cured in oven at ordinary temperatures until dry and hard.

Burn rate: Rapid.
Chamber pressure: 71,000 psi (estimated).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***59.7% ammonium nitrate, 19.9% nitrocellulose, 9.95% corn starch, 9.95% dinitrotoluene, 0.49% diphenylamine, 0.01% graphite and mixed residues***
Classification: Deflagrating explosive (classified as propellant).
Use: Suitable composition for use in canons and howitzers.

04-01-012A: Ammonium nitrate high performance gun propellant:

Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***350 grams of ammonium nitrate***, followed by ***75 grams of barium nitrate***, followed by ***100 grams of potassium ferrocyanide***, followed by ***160 grams of sodium benzoate***, followed by ***50 grams of potassium chlorate***, followed by ***50 grams of nitrocellulose***, and then followed by ***5 grams of lamp black***. Thereafter, tumble the entire mixture at 250 RPM for about 2 hours. Thereafter, remove the steel shot from the mixture in the usual manner, and then place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 150 milliliters of hexane. Thereafter, blend the mixture on moderate speed for about 1 hour in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed through any desired screen size, or pressed through any die cast machine to form grains of any desired diameter. In any case, the grains should be coated with a little graphite, and then cured in an oven at moderate temperature in the usual manner. Thereafter, the grains are ready for loading into any desirable shell casing utilizing the normal techniques.
Burn rate: Rapid.
Chamber pressure: 54,000 psi (estimated).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions.
Percentage: ***44.3% ammonium nitrate, 20.25% sodium benzoate, 12.65% potassium ferrocyanide, 9.49% barium nitrate, 6.32% potassium chlorate, 6.32% nitrocellulose, 0.63% lamp black, 0.04% graphite and mixed residues***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used as general propellant for field guns, cannons, and ship guns.

04-01-013A: High performance ammonium nitrate based gun propellant:
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***200 grams of nitrocellulose***, and then add in 450 milliliters of linseed oil. Thereafter, blend the mixture for about 15 minutes to form a paste. Thereafter, add in ***45 grams of flours of sulfur***, followed by ***375 grams of ammonium nitrate***, and then blend the mixture on moderate speed for about 10 minutes. Thereafter, add in ***95 grams of wheat flour***, followed by ***15 grams of sodium azide***, and then continue to blend the mixture for about 45 minutes. Thereafter the mixture is ready for pressing. To do so, the mixture simply needs to be transferred to any die press, and then extruded through dies of any desired diameter or dimensions to form spaghetti like strands, and then cut the strands into any desired length in the usual manner. The grains should then be glazed with graphite, and then cured in an oven or similar device at moderate temperature until dry and hard. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 70,000 psi (estimated).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***51.36% ammonium nitrate, 27.39% nitrocellulose, 13.01% wheat flour, 6.16% sulfur, 2.05% sodium azide, 0.03% graphite and impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in firearms of any desired caliber.

04-01-014A: High performance nitrate based gun propellant:
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place 200 milliliters of hexane, followed by ***200 grams of starch***, followed by ***100 grams of powdered soft wood charcoal***, followed by ***100 grams of barium nitrate***, and then followed by ***500 grams of ammonium nitrate***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture on moderate speed for about 1 hour. Thereafter the mixture is ready for using. To use, the mixture simply needs to be pressed through any desired die press machine to form any desired diameter and length of spaghetti-like strands. These strands then need to be cut into grains of any desired diameter in the usual manner. The grains should then be coated with graphite, and then cured in an oven or similar device at moderate temperature until dry and hard. If desired, the mixture can be used as a loose powder in flash bags or the like for cannons.
Burn rate: Rapid.
Chamber pressure: 50,000 psi (estimated).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.

Explosive ability: Possible, but unlikely.
Percentage: ***55.55% ammonium nitrate, 22.22% starch, 11.11% charcoal, 11.11% barium nitrate, 0.01% graphite and mixed impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in various firearms and cannons.

04-01-015A: High performance ammonium nitrate gun propellant with potassium picrate booster:
Into a suitable ball mill, or vertical mixer, filled with 150 grams of Teflon coated steel shot, place ***125 grams of potassium picrate***, and then followed by ***260 grams of ammonium nitrate***. Thereafter, tumble or rotate the mixture at 175 RPM for about 2 hours at room temperature. Thereafter, add in ***100 grams of flours of sulfur,*** and then followed by ***15 grams of soft wood charcoal.*** Thereafter, continue to tumble the mixture for about 1 hour. Thereafter, place this tumbled mixture into a clean mixing bowl, equipped with motorized stirrer, and then add in 75 milliliters of a 50:50 ether/hexane mixture, and then blend the mixture for about 30 minutes in the absence of air. After the mixing period, the mixture is ready for extrusion. To do so, the material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strands in the usual manner. Thereafter, the strands should be cut into 1 to 2 millimeters in length, and then resulting grains should be cured in an oven at moderate temperature in the usual manner. The mixture can be granulated using any desired means if desired.
Burn rate: Rapid.
Chamber pressure: 55,000 psi (estimated).
Muzzle Velocity: 2600 feet per second.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Capable of detonating, but only under severe conditions.
Percentage: ***52% ammonium nitrate, 25% potassium picrate, 20% sulfur, 3% soft wood charcoal***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in shoguns, and riffles, but is recommended for use in heavy guns.

04-01-016A: High performance ammonium nitrate gun propellant:
Into a suitable ball mill, or vertical mixer, place ***520 grams of ammonium nitrate***, followed by ***110 grams of finely divided graphite***, followed by ***74 grams of sodium hypophosphite***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and the add in ***160 grams of potassium nitrate***, followed by ***180 grams of nitrocellulose***, and then followed by 175 milliliters of acetone and 75 milliliters of ether. Thereafter, blend the mixture at room temperature for about 1 hour. Note: the mixing drum should be closed to prevent evaporation of the solvent. After the mixing period, the mixture is ready for extrusion. To do so, the material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strand of 3 to 5 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the strands should be cut into 1 to 2 millimeters in length, and then resulting grains should be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 45,000 psi (estimated).
Muzzle Velocity: 2200 feet per second.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***49.8% ammonium nitrate, 17.24% nitrocellulose, 15.32% potassium nitrate, 10.53% graphite, 7.08% sodium hypophosphite, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in small arms weapons.

04-01-017A: High performance ammonium nitrate gun propellant:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***200 grams of nitrocellulose***, and then followed by 2500 milliliters of water. Thereafter, blend the mixture at 30 Celsius for about 10 minutes to evenly disperse the nitrocellulose. Thereafter, add in ***190 gram of dinitrotoluene***, followed by ***45 grams of dibutylphthalate***, and then continue to blend the mixture for about 10 minutes. Thereafter, add in ***15 grams of diphenylamine***, and then once again, continue to blend the mixture for about 10 minuets at 30 Celsius. Now, filter-off the insoluble mass, and then vacuum dry or air-dry the filtered-off solids. Thereafter, place the dried mass into a clean

mixing drum, or vertical mixer, equipped with motorized stirrer, and then add in ***547 grams of ammonium nitrate***, followed by 150 milliliters of 95% ethyl alcohol and 75 milliliters of ether. Thereafter, blend the mixture for about 45 minutes at 41 Celsius. Thereafter, the mixture is ready for extrusion. To do so, the dough-like material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strands of 3 to 5 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the strands should be cut into 4 to 5 millimeters in length, and the resulting grains should be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 51,000 psi (estimated).
Muzzle Velocity: 2200 feet per second.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***54.86% ammonium nitrate, 20% nitrocellulose, 19% dinitrotoluene, 4.4% dibutylphthalate, 1.5% diphenylamine, 0.24% graphite and mixed residua***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in ammunition for the usual weapons.

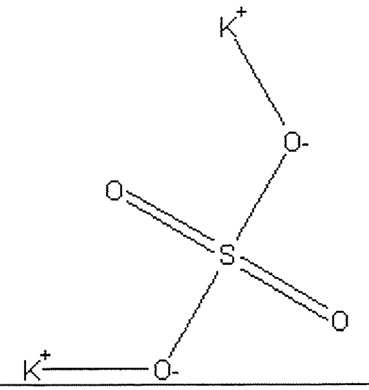
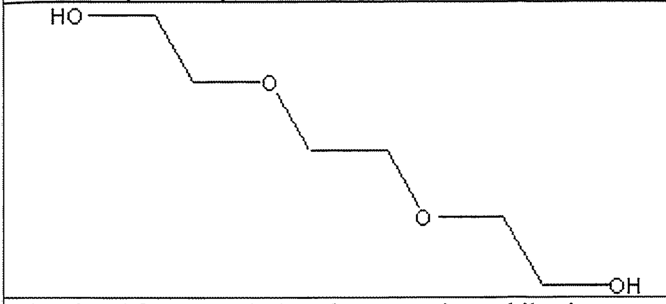
04-01-018A: High performance ammonium nitrate gun propellant:
Into suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***375 grams of ammonium nitrate***, followed by ***75 grams of flours of sulfur***, followed by ***50 grams of soft wood charcoal***, and then followed by ***15 grams of sodium chloride***. Thereafter, tumble the mixture at 500 RPM for about 2 hours. Thereafter, remove the steel shot using the desired screens, and then place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 100 milliliters of 95% ethyl alcohol, and then blend the mixture for about 45 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strands of 3 to 5 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the strands should be cut into 4 to 5 millimeters in length, and the resulting grains should be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if desired. If desired, the mixture can be used as a loose powder.
Burn rate: Rapid.
Chamber pressure: 49,000 psi (estimated).
Muzzle Velocity: 2750 feet per second.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***72.81% ammonium nitrate, 14.56% sulfur, 9.7% soft wood charcoal, 2.91% sodium chloride, 0.02% graphite and residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in shotgun and pistol ammo.

04-01-018B: High performance ammonium nitrate gun propellant:
Into suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***375 grams of ammonium nitrate***, followed by ***75 grams of flours of sulfur***, followed by ***50 grams of soft wood charcoal,*** followed by ***50 grams of nitrocellulose***, followed by ***25 grams of barium nitrate***, and then followed by ***15 grams of sodium chloride***. Thereafter, tumble the mixture at 500 RPM for about 2 hours. Thereafter, remove the steel shot using the desired screens, and then place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 100 milliliters of 95% ethyl alcohol, and then blend the mixture for about 45 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strands of 3 to 5 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the strands should be cut into 4 to 5 millimeters in length, and the resulting grains should be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if desired. If desired, the mixture can be used as a loose powder.
Burn rate: Rapid.
Chamber pressure: 50,000 psi (estimated).
Muzzle Velocity: N/A
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***63.55% ammonium nitrate, 12.71% sulfur, 8.47% soft wood charcoal, 8.47% nitrocellulose, 4.23% barium nitrate, 2.54% sodium chloride, 0.03% graphite and mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in shotgun and pistol ammo.

Section 2: Nitrocellulose containing

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate	**76. Lead Stearate**
	$[CH_3(CH_2)_{16}COO]_2Pb$
Forms colorless to white crystals, granules, or powder. The sulfate is relatively insoluble in water, alcohol, and other solvents.	Lead stearate forms a white powder or granular mass. The melting point of the salt is 125 Celsius. Lead stearate is toxic, so users should use caution and wear proper gloves.
77. Triethylene Glycol	
	
The glycol forms a colorless, hygroscopic, mobile viscous liquid. The melting point of the glycol is –7.2 Celsius, and its boiling point at STP is 285 Celsius. Triethylene glycol is an important plasticizer for use in explosives and pyrotechnics.	

- High Performance Nitrocellulose Gun Propellants in this section -

1. 04-02-001A: Nitrocellulose high performance gun propellant (military grade gunpowder; double based): *56.83% nitroglycerine, 27.14% nitrocellulose, 6.33% potassium nitrate, 5.97% 4,4'-diphenylmethane diisocyanate plasticizer, 2.98% glue, 0.67% diethyldiphenylurea catalyst, 0.08% graphite*	**2. 04-02-002A: Nitrocellulose high performance gun propellant (military grade gunpowder; double based):** *63.3% nitrocellulose, 17% potassium nitrate, 17% KDN, 1.5% diethyldiphenylurea, 1% potassium sulfate smoke reducer, 0.20% impurities*
3. 04-02-003A: Nitrocellulose "Smokeless powder": *85.83% nitrocellulose, 12.87% potassium nitrate, 1.28% diphenylamine catalyst, 0.02% impurities*	**4. 04-02-004A: Nitrocellulose and cellulose azidonitrate high performance gun propellant:** *49% nitrocellulose, 49% cellulose azidonitrate, 1.4% diphenylamine, 0.28% graphite, 0.320% residue*
5. 04-02-005A: Nitrocellulose high performance gun propellant with increased ballistic properties: *84.9% nitrocellulose, 9.7% nitroguanidine, 4.3% barium nitrate, 0.43% diphenylamine, 0.29% residue, 0.24% graphite, 0.14% TNT*	**6. 04-02-006A: Nitrocellulose high performance gun propellant for small arms weapons:** *94.9% nitrocellulose, 1.8% potassium nitrate, 1% methyl centralite, 1% diphenylamine, 0.63% potassium aluminum fluoride, 0.37% graphite, 0.30% moisture*
7. 04-02-007A: Nitrocellulose gun propellant utilizing the dispersion/flotation method: *84.4% nitrocellulose, 9% lead stearate, 4.6% dioctylphthalate, 1.8% 2-nitrodiphenylamine, 0.20% animal glue*	**8. 04-02-008A: Nitrocellulose smokeless gun propellant:** *85.3% nitrocellulose, 9.8% nitroguanidine, 4.4% barium nitrate, 0.44% diphenylamine, 0.06% graphite*
9. 04-02-009A: Improved nitrocellulose smokeless gun propellant: *80% nitrocellulose, 14% potassium nitrate, 3%*	**10. 04-02-010A: Nitrocellulose smokeless gun propellant specifically for shotguns:** *72% nitrocellulose, 18.1%*

barium nitrate, 3% charcoal	*nitroglycerine, 9% methylcellulose, 0.69% diethyldiphenylamine, 0.21% combined balance including, 0.05% graphite*
11. 04-02-010B: Nitrocellulose smokeless gun propellant specifically for shotguns (increased chamber pressure via coal dust): *75.4% nitrocellulose, 19% nitroglycerine, 4.7% coal dust, 0.73% diethyldiphenylamine, 0.17% combined balance including, 0.05% graphite*	**12. 04-02-011A: Nitrocellulose gun propellant (US ARMY M6 propellant):** *86% nitrocellulose, 10% dinitrotoluene, 3% dibutylphthalate, 1% diphenylamine*
13. 04-02-011B: Nitrocellulose gun propellant (US ARMY M6 propellant), with flash suppression addictive: *85% nitrocellulose, 10% dinitrotoluene, 3% dibutylphthalate, 1% diphenylamine, 1% potassium sulfate*	**14. 04-02-011C: Nitrocellulose gun propellant (former US Navy propellant—pyro propellant):** *99% nitrocellulose, 1% diphenylamine*
15. 04-02-012A: Standard high performance nitrocellulose gun propellant: *66% nitrocellulose, 16% nitroglycerine, 16% polyvinyl nitrate, 1% 2-nitrodiphenyl, 1% impurities*	**16. 04-02-013A: Standard high performance nitrocellulose "double base" smokeless powder with reduced flash:** *50.6% nitrocellulose, 30% nitroglycerine, 10% ethyl abietate, 6% barium nitrate, 2% potassium nitrate, 0.76% diphenylamine, 0.64% residue*
17. 04-02-014A: Standard high performance nitrocellulose (high nitroglycerine content) smokeless powder with reduced flash: *70% nitroglycerine, 23% nitrocellulose, 5% lycopodium, 2% urea*	**18. 04-02-014B: Standard high performance nitrocellulose (high nitroglycerine content) smokeless powder with reduced flash (modified using dinitrobenzene):** *70% nitroglycerine, 23% nitrocellulose, 5% lycopodium, 2% dinitrobenzene*
19. 04-02-015A: High performance nitrocellulose (high nitroglycerine content) smokeless powder with reduced flash (modified using dinitrobenzene): *55% nitroglycerine, 30% nitrocellulose, 10% Vaseline, 5% camphor*	**20. 04-02-016A: High performance nitrocellulose smokeless powder with reduced flash:** *60% nitrocellulose, 30% nitroglycerine, 5% diamyl phthalate, 5% mineral jelly*
21. 04-02-017A: High performance nitrocellulose smokeless powder: *52.6% nitrocellulose, 42.1% nitroglycerine, 2.6% Vaseline, 2.6% olive oil, 0.1% impurities*	**22. 04-02-017B: High performance nitrocellulose smokeless powder (fortified with barium tartrate burn enhancer):** *50% nitrocellulose, 40% nitroglycerine, 4% barium tartrate, 2.5Vaseline, 2.6% olive oil, 0.90% potassium tartrate, 0.1% mixed balance*
23. 04-02-018A: High performance nitrocellulose smokeless powder containing diethyldiphenylcarbamid burn enhancer: *50% nitrocellulose, 40% nitroglycerine, 4% barium tartrate, 2.5Vaseline, 2.6% olive oil, 0.90% potassium tartrate, 0.1% mixed balance*	**24. 04-02-018B: High performance nitrocellulose smokeless powder with potassium lactate stabilizer:** *69.88% nitrocellulose, 23.12% nitroglycerine, 5% Vaseline, 2% potassium lactate*
25. 04-02-019A: High performance nitrocellulose smokeless powder (utilizing the "Schultze" process): *72.22% nitrocellulose, 16.66% barium nitrate, 4.16% potassium nitrate, 4.16% paraffin oil, 2.77% starch, 0.03% mixed residues*	**26. 04-02-020A: High performance nitrocellulose smokeless powder:** *89.28% nitrocellulose, 8.92% black powder, 1.78% dinitrotoluene binder, 0.02 mixed balance*
27. 04-02-021A: High performance nitrocellulose smokeless powder (military grade): *40.1% nitroguanidine, 34.09% nitroglycerine, 24.73% nitrocellulose, 1.06% methyl diphenylurea, 0.02% mixed residue*	**28. 04-02-021B: High performance nitrocellulose smokeless powder (military grade):** *52.47% nitrocellulose, 35.64% nitroglycerine, 9.9% nitroguanidine, 1.98% diethyl diphenylamine, 0.01% residues*
29. 04-02-022A: High performance nitrocellulose gun propellant (potassium nitrate fortified): *56.43% nitrocellulose, 33.86% potassium nitrate, 8.46% dibutyl phthalate, 0.677% dinitrotoluene, 0.22% calcium carbonate, 0.168% ethyl cellulose, 0.168% diphenylamine, 0.017% mixed balance*	**30. 04-02-023A: High performance nitrocellulose gun propellant (with TNT modifier):** *71.2% nitrocellulose, 20% nitroglycerine, 6.6% TNT, 1.2% dinitrotoluene*
31. 04-02-024A: High performance nitrocellulose gun propellant: *68% nitrocellulose, 27% nitrocellulose, 4% diamyl phthalate, 1% residue*	**32. 04-02-025A: High performance nitrocellulose gun propellant:** *77.98% nitrocellulose, 20.01% nitroglycerine, 2% dinitrotoluene, 0.01% mixed residues*
33. 04-02-026A: High performance nitrocellulose gun propellant: *79.6% nitrocellulose, 9.95% corn starch, 9.95% dinitrotoluene, 0.49% diphenylamine, 0.01% graphite*	**34. 04-02-027A: High performance nitrocellulose gun propellant:** *74.5% nitrocellulose, 20% dinitrobenzene, 5% mononitroxylene, 0.50% diphenylamine*
35. 04-02-028A: High performance "flashless" nitrocellulose gun propellant: *85% nitrocellulose, 10% dinitrotoluene, 2.5% triethylene glycol, 2.5% caprylic acid*	**36. 04-02-028B: High performance "flashless" nitrocellulose gun propellant:** *80% nitrocellulose, 15% dinitrotoluene, 5% triethylene glycol caprylate*

37. 04-02-029A: High performance "clean burning" nitrocellulose smokeless gun propellant: *85% nitrocellulose, 6.18% butyl stearate, 5.67% animal glue, 0.98% ethyl centralite, 0.98% basic lead carbonate, 0.98% potassium sulfate, 0.21% impurities*	

Formulating Nitrocellulose Compositions:

Nitrocellulose	Nitroglycerine	Combustible (reducing agent	Addictive (oxidizer)	Filler (binder)
10 parts	2 parts	1 part	1 part	½ part
20 parts	5 parts	2 parts	1 part	1 part
30 parts	11 parts	3 parts	2 parts	2 parts
40 parts (low smoke)	23 parts	5 parts	3 parts	2.5 parts
60 parts (high power)	30 parts	5 parts	1 part	2 parts
70 parts (high power 2)	30 parts	7 parts	1 part	4 parts
90 parts (high power 3: direct fire guns)	40 parts	10 parts	5 parts	6 parts
100 parts (artillery grade)	40 parts	12 parts	6 parts	10 parts
120 parts (lower burn)	30 parts	20 parts	10 parts	10 parts
140 parts (artillery grade: reduced flash)	60 parts	30 parts	20 parts	20 parts
160 parts	60 parts	60 parts	20 parts	20 parts
180 parts	80 parts	50 parts	40 parts	20 parts

Warning! Use great care when handling nitroglycerine, and make sure to wear proper protective clothing, gloves, ect., and ALWAYS make sure to wear a respirator or protective mask to avoid inhalation of nitroglycerine vapors. Inhalation of nitroglycerine vapors WILL lead to severe headaches/migraines that can hang around for WEEKS! Protecting yourself from skin absorption, and inhalation of nitroglycerine super precedes safety from its explosion hazards.

04-02-001A: Nitrocellulose high performance gun propellant (military grade gunpowder; double based):
Place 178 grams of water into a 1600-milliliter beaker and then heat to 50 Celsius. Thereafter, add in ***60 grams of nitrocellulose*** (any nitrogen content will work, but 13 to 14% nitrogen content is recommended), followed by 354 milliliters of ethyl acetate, and then followed by ***125.6 grams of nitroglycerine***. Thereafter, begin a moderate stir of the contents, and then add in ***1.5 grams of diethyldiphenylurea***, and then stir the entire mixture for about 30 minutes at 50 Celsius. After 30 minutes, add in ***14 grams of potassium nitrate*** followed by ***13.2 grams of 4,4'-diphenylmethane diisocyanate***, and then continue stirring the mixture at 50 Celsius for 30 minutes. After which, add in a special glue solution prepared by mixing ***6.6 grams of standard glue*** with 370 milliliters of water. After the addition of the glue solution, rapidly stir the mixture at 50 Celsius for 1 hour. Then, place the entire mixture into a shallow pan with a high surface area and allow it to thoroughly dry until the smell of solvent (ethyl acetate) is gone. When the smell of ethyl acetate is gone, place the remaining contents of the pan into 2000 milliliters of water, and then heat the mixture with stirring at 50 Celsius for 2 hours. After 2 hours, place the entire mixture into a centrifugal machine and spin at high RPM to separate the water from the solids. If you don't have a centrifugal machine, you can attempt to allow the insoluble solids to settle, and then gravity filter or vacuum filter to recover the insoluble solids. If using a centrifugal machine, remove the solids from the centrifugal machine by pouring off the water, and then vacuum dry the solids or let them air-dry (takes a long time). Either way, place the dry solids into a plastic bag and then add in ***100 milligrams of finely divided graphite***, and then shake the bag thoroughly to coat the solids with the graphite. Thereafter, remove the coated solids from the plastic bag, and place the solids onto a tray and then dry them in an oven at 60 Celsius for 1 day. The resulting granular propellant will have a flat, circular plate-like shape, or flat oval plate-like shape. The solids can then be used directly in shell casings for propelling bullets and shells of many types and sizes. Note: Use standard military gun primers, either firing pin or electrical for initiation of propellant.
Burn rate: Very rapid.
Chamber pressure: 45,000 psi (estimated).
Muzzle Velocity: 2200 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.

Percentage: ***56.83% nitroglycerine, 27.14% nitrocellulose, 6.33% potassium nitrate, 5.97% 4,4'-diphenylmethane diisocyanate plasticizer, 2.98% glue, 0.67% diethyldiphenylurea catalyst, 0.08% graphite***
Classification: Deflagrating explosive (classified as explosive).
Use: Used in military ammunition for riffles, machine guns, tanks, and for propelling artillery shells.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with.

04-02-002A: Nitrocellulose high performance gun propellant (military grade gunpowder; double based):
Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***126 grams of nitrocellulose*** (13 to 14% nitrogen content preferred), followed by ***2 grams of potassium sulfate***. Immediately thereafter, begin moderate blending for 20 minutes. Thereafter, carefully add in ***34 grams of potassium nitrate***, and then ***34 grams of KDN***. During the addition, moderately blend the mixture (low speed). After the addition, moderately blend the mixture for 30 minutes. After 30 minutes, add in ***3 grams of diethyldiphenylurea***, and then continue moderately blending the mixture for about 30 minutes at room temperature. Thereafter, quickly add in, 120 milliliters of a solvent mixture prepared by mixing 48 milliliters of diethyl ether with 72 milliliters of 95% ethyl alcohol. After the addition of the solvent mixture, increase the blending speed to rapid, and then continue to blend for 3 hours at room temperature. After blending for 3 hours, remove the "dough" like material from the mixing blender. Now, what you do next is up to you; for example, the dough like propellant material may be charged into a standard extruding machine (like a spaghetti making machine) with multiple holes (1 to 2mm each hole), and then extruded under pressure into strands of average length (5 to 10 cm each strand). After which, the strands can be cut into small pieces (granules) 1 to 2 mm each piece. The cut pieces are then cured on shallow pans for several days prior to use. The resulting granules can then be charged into any desirable cartridge case. Instead of extruding the dough like propellant, you can place it onto a pan and allow it to cure for several days. Thereafter, you can place the dried mass into a ball mill, followed by 100 grams of Teflon coated steel balls (of any desired size), and then mix the contents to form granules or powder at any desired RPM. Note: the rotation speed of the ball mill, the size of the steel balls, and the time of mixing are dependent on the size of the desired granules, or powder. After the mixing process, the granules or powder can be separated into their distinct grain sizes by using different sized sieves (mesh). Grain sizes of less then 1 millimeter can be used in firearms, 1.5 to 2 millimeters can be used in heavy gun casings such as machine guns, 2.5 to 3 millimeters can be used in ammunition casings for 20 millimeter to 90 millimeter shells, 4 to 5.9 millimeters can be used in tank shell casings, and 6 to 12 millimeter grains can be used in artillery guns of up to 180 millimeters. Note: Use standard military gun primers, either firing pin or electrical for initiation of propellant.
Burn rate: Rapid.
Chamber pressure: 49,000 psi (estimated).
Muzzle Velocity: 2500 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***63.3% nitrocellulose, 17% potassium nitrate, 17% KDN, 1.5% diethyldiphenylurea, 1% potassium sulfate smoke reducer, 0.20% impurities***
Classification: Deflagrating explosive (classified as explosive).
Use: Used in commercial, civil, and sporting ammunition.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with.

04-02-003A: Nitrocellulose "Smokeless powder":
Into a standard ball mill, add ***200 grams of nitrocellulose*** (13 to 14% nitrogen content preferred, but any grade will work), followed by 82 milliliters of cold water. Thereafter and in 100 grams of Teflon coated steel shot of 5 millimeters in diameter, and then rotate the mixture at 190 RPM for 1 hour. After 1 hour, add in a solvent mixture prepared by mixing 210 milliliters of diethyl ether with 90 milliliters of 95% ethyl alcohol. After the addition, continue to rotate the mixture at 190 RPM for about 1 hour at room temperature. Thereafter, add in ***30 grams of potassium nitrate***, followed by ***3 grams of diphenylamine***. Then continue to rotate the entire mixture at 190 RPM for 1 hour at room temperature. After blending for 1 hour, pour in 1000 milliliters of cold water, and then continue to rotate the mixture at 190 RPM for about 15 minutes. After 15 minutes, filter the entire mixture using gravity filtration, or vacuum filtration (preferred). After the filtration process, recover the pasty mass, if using gravity filtration, or recover the moist mass, if using vacuum filtration. If you used gravity filtration, place the pasty mass onto a shallow pan, and allow it to air-dry, but only until it becomes damp, not fully dried. If you used vacuum filtration, place the moist mass directly into an extruding machine. If you used gravity filtration, place your damp propellant, after it has partially dried, into an identical extruding machine. The extruding machine (like a spaghetti making machine), should have holes of 1 to 2 millimeters in diameter. Then extrude the propellant under pressure to form spaghetti-like strands about 12 to 15 inches in length each one. Thereafter, cut the strands into granules of 1 to 2 millimeters, and then cure them for several days at room temperature. Instead of extruding the damp propellant mass, you can set it onto a shallow pan, after collection by filtration, and allow the mass to thoroughly dry. Thereafter, you can pulverize the mass by hand, or using a ball mill to form various grain sizes, which can be separated using various sizes of sieves under the normal way.

Burn rate: Rapid.
Chamber pressure: 48,000 psi (estimated).
Muzzle Velocity: 2450 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***85.83% nitrocellulose, 12.87% potassium nitrate, 1.28% diphenylamine catalyst, 0.02% impurities***
Classification: Deflagrating explosive (classified as explosive).
Use: Used in military ammunition for riffles, machine guns, tanks, and for propelling artillery shells. Can also be used in blasting powders with grain sizes of less then 1 millimeter when triggered with a suitable TNT booster.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. During the heating process caution should be taken to avoid excessive heat or friction. Make sure to thoroughly stir the mixture during the heating process to avoid lumps or clumps, which can lead to excessive heat build-up. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with.

04-02-004A: Nitrocellulose and cellulose azidonitrate high performance gun propellant:
Step 1: preparation of cellulose azidonitrate:
Into a suitable beaker, place 625 milliliters of dimethylsulfoxide (DMSO), and then add and dissolve 17.5 grams of nitrocellulose (any grade will do), followed by 12.5 grams of sodium azide. Thereafter, heat the mixture to about 65 Celsius and stir the mixture at this temperature for about 66 hours. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, pour the entire mixture into 625 milliliters of ice-cold water (contained in a suitable beaker), and then stir the entire mixture for about 30 minutes. Then, filter-off the insoluble gelatinous precipitate, and then allow it to air-dry. The result will be about 8.75 grams of cellulose azidonitrate product.
Step 2: Preparation of gun propellant:
Place the ***8.75 grams of cellulose azidonitrate*** product into a clean beaker or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, followed by ***8.75 grams of nitrocellulose*** (of any nitrogen content), and then followed by ***250 milligrams of diphenylamine***, and then add in 100 milliliters of 95% ethyl alcohol, and then moderately stir the mixture until most of the solvent has evaporated to yield a dough-like material. Thereafter, place the dough-like material onto a shallow tray and allow it to thoroughly air-dry. Finally, the propellant is ready to be used, but first it should be coated with graphite, so place the granulated propellant grains into a plastic bag and then throw in ***100 milligrams of finely powdered graphite***, and then shake the bag vigorously for a few minutes. Thereafter, the coated grains are ready for use.
Burn rate: Rapid.
Chamber pressure: 51,000 psi (estimated).
Muzzle Velocity: 2760 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***49% nitrocellulose, 49% cellulose azidonitrate, 1.4% diphenylamine, 0.28% graphite, 0.320% residue***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in tank ammunition and for propelling heavy shells.

04-02-005A: Nitrocellulose high performance gun propellant with increased ballistic properties:

Into a suitable mixing bowl, blender, ect., place ***426 grams of nitrocellulose*** (of average nitrogen content), followed by 500 milliliters of isopropyl alcohol, and then blend the mixture for about 10 minutes. After 10 minuets, add in ***49 grams of nitroguanidine***, and then continue to blend the mixture for about 10 minutes. Thereafter, add in ***22 grams of barium nitrate***, followed by ***2.2 grams of diphenylamine***, and then continue to blend the mixture to form a dough-like mixture. Note: mixing for several hours may be needed in order to facilitate evaporation of some of the alcohol to form proper dough. Once a dough-like material has been formed, it needs to be placed into a standard extruding machine utilizing holes of 1.2 to 2.5 millimeters in diameter for small arms and riffles, or 2.5 to 3 millimeters in diameter for heavy machine guns, or 5 to 7.5 millimeters diameters for 25 millimeter to 125 millimeter projectiles, or 7.5 to 12 millimeters in diameter for artillery cannons, and then extrude the dough-like material under a pressure of 3000 psi into spaghetti-like strands of 1 to 2 feet in length. Thereafter, the spaghetti-like strands should be cut into lengths of: a) for small arms and riffles, cut into 5 millimeter lengths, b) for heavy machine guns, cut into 10 millimeter lengths, c) for 25 to 125 millimeter weapons, cut into 10 to 20 millimeter lengths, and for e) for artillery cannons, cut into 15 to 25 millimeter lengths. Note: exact diameter and lengths for the extruded grains can vary and is not set in stone. Thereafter, place the grains onto a shallow pan, and cure them in an oven at 55 Celsius for several days until they are thoroughly dry. Then, place the grains into a standard horizontal bal mill, minus the steel shot, and then add in ***1.5 grams of finely powdered TNT***, and then gently tumble the grains at 15 to 20 RPM for about 10 to 15 minutes to form coated grains. Thereafter, add in ***2.5 grams of graphite powder***, and then continue to gently tumble the grains for about 15 minutes to thoroughly coat them with graphite. Thereafter, the grains are ready for us. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation.

Burn rate: Rapid.
Chamber pressure: 49,000 psi (estimated).
Muzzle Velocity: 2300 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***84.9% nitrocellulose, 9.7% nitroguanidine, 4.3% barium nitrate, 0.43% diphenylamine, 0.29% residue, 0.24% graphite, 0.14% TNT***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in small arms ammunition and ammunition of many types.

04-02-006A: Nitrocellulose high performance gun propellant for small arms weapons:
Into a suitable mixing bowl, blender, ect., place ***450 grams of nitrocellulose*** (of average nitrogen content), followed by 300 milliliters of diethyl ether, followed by 200 milliliters of 95% ethyl alcohol, and then blend the mixture for about 10 minutes. After 10 minuets, add in ***9 grams of potassium nitrate***, and then continue to blend the mixture for about 10 minutes. Thereafter, add in ***5 grams of diphenylamine***, followed by ***3 grams of potassium aluminum fluoride***, followed by ***5 grams of methyl centralite***, and then continue to blend the mixture to form a dough-like mixture. Note: mixing for an hour or more may be needed in order to facilitate evaporation of some of the alcohol/ether to form a proper dough. Once a dough-like material has been formed, it needs to be placed into a standard extruding machine utilizing tubular holes of 2.5 to 3 millimeters outside diameter with 0.50 to 1.0 millimeters inside diameter for small arms and riffles, and then extrude the dough-like material under a pressure of 3000 psi into hollow spaghetti-like strands of 1 to 2 feet in length. Thereafter, the spaghetti-like strands should be cut into lengths of 3 to 5 millimeters lengths. Note: exact diameter and lengths for the extruded grains can vary and is not set in stone. Thereafter, place the grains into a horizontal ball mill, minus the steel shot, and then add in 80 milliliters of water, followed by ***1.8 grams of finely powdered graphite***, and then gently tumble the grains at 50 RPM for about 10 minutes. Thereafter, continue to tumble the mixture on low RPM, and then inject a steady stream of steam into the ball mill (keep the ball mill open at the entrance, i.e., do not seal), and then continue to tumble the grains at 50 RPM and continue to inject a steady stream of steam into the ball mill for about 30 minutes. After 30 minutes, remove the steam source, stop the tumbling, and then pour the entire mixture into a suitable sized beaker filled with 500 milliliters of hot water (60 Celsius), and then allow the grains to stand for 22 hours. After 22 hours, filter-off the insoluble grains, and then place the filtered-off grains onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, the grains are ready for use. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation.

Burn rate: Rapid.
Chamber pressure: 51,000 psi (estimated).
Muzzle Velocity: 2790 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.

Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***94.9% nitrocellulose, 1.8% potassium nitrate, 1% methyl centralite, 1% diphenylamine, 0.63% potassium aluminum fluoride, 0.37% graphite, 0.30% moisture***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in small arms ammunition for pistols, shotguns, and riffles.

04-02-007A: Nitrocellulose gun propellant utilizing the dispersion/flotation method:
Into a large suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***325 grams of nitrocellulose*** (of average nitrogen content), followed by 4500 milliliters of water, and then allow the mixture to stand for the meantime. In the meantime, into a different mixing bowl, equipped with a motorized stirrer, place ***35 grams of lead stearate***, followed by 600 milliliters of a saturated solvent mixture prepared by adding and dissolving 400 milliliters of methyl ethyl ketone, into 100 milliliters of toluene, and then saturating the solvent mixture with 100 milliliters of water. Thereafter, blend the mixture on moderate speed for about 10 minutes, and then add in ***18 grams of dioctylphthalate***, followed by ***7 grams of 2-nitrodiphenylamine***, and then continue to blend the mixture on moderate speed for about 30 minutes to form a homogenous mixture. Thereafter, add in 1000 milliliters of methyl ethyl ketone, followed by 260 milliliters of toluene, and then followed by 260 milliliters of water, and then continue to blend the mixture on moderate speed for about 5 minutes. Thereafter, add in the nitrocellulose/water mixture prepared earlier, and then blend the entire mixture on high for about 30 minutes to form a uniform dispersion. Thereafter, prepare a glue solution by adding and dissolving 175 grams of standard animal glue into 400 milliliters of water, and then add this glue solution to the propellant mixture, and then continue to blend the entire mixture on high for another10 to 15 minutes. Thereafter add in a sodium sulfate solution prepared by adding and dissolving 175 grams of sodium sulfate into 400 milliliters of water, and then pour the entire mixture into a suitable distillation apparatus, and distill-off the methyl ethyl ketone and toluene by distillation at 110 Celsius. Note: a vacuum can be applied to speed up the distillation process, and thereby allowing for lower temperature of distillation. When al the solvents has been removed, remove the heat source, and then pour the entire remaining aqueous mixture into a suitable sized beaker (after it has cooled), and then filter-off the propellant grains. After collecting the propellant grains, wash the grains with several portions of cold water, and then place the grains onto a shallow tray, and then dry the grains in an oven at 100 Celsius until dry. Thereafter, the grains are ready for use. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation.

Burn rate: Rapid.
Chamber pressure: 46000 psi (estimated).
Muzzle Velocity: 2300 feet per second.
Primary Attribute: Smokeless and flashless.
Chamber pressure: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***84.4% nitrocellulose, 9% lead stearate, 4.6% dioctylphthalate, 1.8% 2-nitrodiphenylamine, 0.20% animal glue***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in low pressure/low velocity gun systems such as 40-millimeter munitions, bazookas, and mortars.

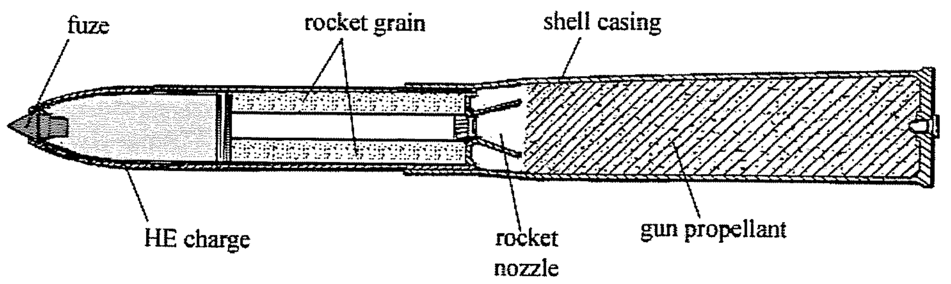
04-02-008A: Nitrocellulose smokeless gun propellant:
Into a large suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***425 grams of nitrocellulose*** (of average nitrogen content on a dry basis), followed by 250 milliliters of 95% ethyl alcohol or denatured alcohol, and then allow the mixture to stand for about 5 minutes. Thereafter, blend the mixture for about 10 minutes, and then add in ***49 grams of nitroguanidine***, and then continue to blend the mixture for about 10 minutes on moderate speed. After 10 minutes of mixing time, add in ***22 grams of barium nitrate***, and then continue to blend the mixture for about 10 minutes on moderate speed. Thereafter, into a clean beaker or suitable container, add 150 milliliters of diethyl ether, and then add and dissolve ***2.2 grams of diphenylamine***. Thereafter, add this ether/diphenylamine solution to the bulk of the nitrocellulose mixture, and then continue to blend the mixture on moderate speed until the bulk of the solvents evaporate to leave behind a dough-like material. Now, extrude the dough-like material through any desirable die cast machine to form spaghetti like strands of any diameter and length under a hydraulic pressure of about 3000 to 4000 psi. After which, the spaghetti-like strands should be cut into individual equal lengths ranging from 5 to 10 milliliters in diameter. Thereafter the cut cyndrical grains should be cured in an oven at 50 Celsius for about 5 days. After 5 days, the cynidrical grains should be coated with graphite by shaking the grains in a plastic bag or similar container containing powdered graphite. Thereafter, the grains are ready for use. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation.

Burn rate: Rapid.
Chamber pressure: 49,000 psi (estimated).
Muzzle Velocity: 2780 feet per second (estimated).
Primary Attribute: Smokeless and flashless.
Chamber pressure: Moderate.

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***85.3% nitrocellulose, 9.8% nitroguanidine, 4.4% barium nitrate, 0.44% diphenylamine, 0.06% graphite***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in any type of firearms.

04-02-009A: Improved nitrocellulose smokeless gun propellant:
Into a large suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***240 grams of nitrocellulose*** (of average nitrogen content on a dry basis), followed by 150 milliliters of 95% ethyl alcohol or denatured alcohol, and then add in ***42 grams of potassium nitrate,*** followed by ***9 grams of barium nitrate,*** and then followed by ***9 grams of standard wood charcoal***, and then blend the mixture for about 30 minutes on moderate speed to form a uniform dough. Thereafter, extrude the dough-like material through any desirable die cast machine to form spaghetti like strands of any diameter and length under a high hydraulic pressure. After which, the spaghetti-like strands should be cut into individual equal lengths ranging from 5 to 10 milliliters in diameter. Thereafter the cut cyndrical grains should be cured in an oven at 50 to 90 Celsius for 24 hours or more. Note: The cynidrical grains should be coated with graphite by shaking the grains in a plastic bag or similar container containing powdered graphite. Thereafter, the grains are ready for use. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation.
Burn rate: Average.
Chamber pressure: 46,000 psi (estimated).
Muzzle Velocity: 2150 feet per second.
Primary Attribute: Smokeless and flashless.
Chamber pressure: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***80% nitrocellulose, 14% potassium nitrate, 3% barium nitrate, 3% charcoal***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in any type of firearms.

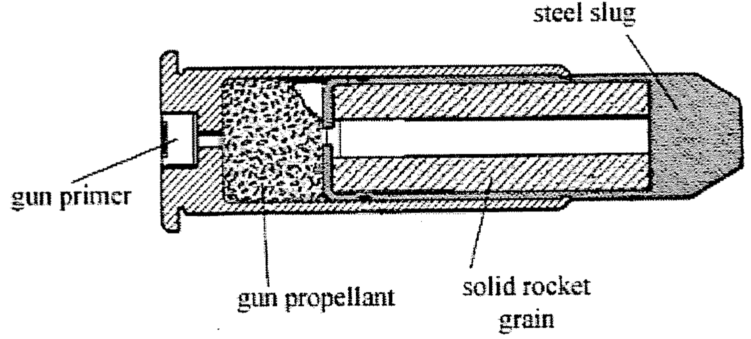
Gun fired rocket projectile



04-02-010A: Nitrocellulose smokeless gun propellant specifically for shotguns:
Into a suitable beaker or similar container, place 150 milliliters of diethyl ether, and then add and dissolve ***60 grams of nitroglycerine***. Thereafter, add in ***2.3 grams of diethyldiphenylamine***, and then gently blend the mixture at room temperature for about 10 minutes. Thereafter, add in ***237.6 grams of nitrocellulose*** of average nitrogen content, and then continue to gently blend the mixture for about 10 to 15 minutes to form a dough. Thereafter, add in ***29.9 grams of methylcellulose***, and then continue to blend the mixture for about 10 to 15 minutes. Note: more ether may be added to compensate for evaporation or loss. Thereafter, the dough is ready to be pressed. To do so, it needs to be extruded through a die cast machine in the usual manner under high pressure to form spaghetti-like strands ranging from 1.6 millimeters in diameter, by 25 millimeters in length. Each 25-millimeter length should then be cut into 300 pieces. The cut grains should then be cured at room temperature for 24 hours or more. Note: The grains should be coated with graphite by shaking the grains in a plastic bag or similar container containing powdered graphite. Thereafter, the grains are ready for use. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation
Burn rate: Average.

Chamber pressure: 51,000 psi (estimated).
Muzzle Velocity: 2750 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***72% nitrocellulose, 18.1% nitroglycerine, 9% methylcellulose, 0.69% diethyldiphenylamine, 0.21% combined balance including, 0.05% graphite***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in shotgun ammo.

Rocket assisted Shot gun slug



04-02-010B: Nitrocellulose smokeless gun propellant specifically for shotguns (increased chamber pressure via coal dust):
This procedure is identical to the above process, but the methylcellulose is replaced with coal dust. Into a suitable beaker or similar container, place 150 milliliters of diethyl ether, and then add and dissolve ***60 grams of nitroglycerine***. Thereafter, add in ***2.3 grams of diethyldiphenylamine***, and then gently blend the mixture at room temperature for about 10 minutes. Thereafter, add in ***237.6 grams of nitrocellulose*** of average nitrogen content, and then continue to gently blend the mixture for about 10 to 15 minutes to form a dough. Thereafter, add in ***15 grams of coal dust***, and then continue to blend the mixture for about 10 to 15 minutes. Note: more ether may be added to compensate for evaporation or loss. Thereafter, the dough is ready to be pressed. To do so, it needs to be extruded through a die cast machine in the usual manner under high pressure to form spaghetti-like strands ranging from 1.6 millimeters in diameter, by 25 millimeters in length. Each 25-millimeter length should then be cut into 300 pieces. The cut grains should then be cured at room temperature for 24 hours or more. Note: The grains should be coated with graphite by shaking the grains in a plastic bag or similar container containing powdered graphite. Thereafter, the grains are ready for use. To use, they simply need to be placed, loosely into any gun casing/cartridge. Utilize a standard gun primer for initiation.
Burn rate: Average.
Velocity: 956 feet per second (based on No. 6 steel shot)
Chamber pressure: 12,500 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***75.4% nitrocellulose, 19% nitroglycerine, 4.7% coal dust, 0.73% diethyldiphenylamine, 0.17% combined balance including, 0.05% graphite***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in shotgun ammo.

04-02-011A: Nitrocellulose gun propellant (US ARMY M6 propellant):
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer in the normal fashion, place 150 to 200 milliliters of 95% ethyl alcohol, followed by ***413 grams of nitrocellulose of 13% nitrogen content***, followed by ***47.5 grams of dinitrotoluene***, followed by ***14.3 grams of dibutylplthalate***, followed by ***4.8 grams of diphenylamine***, and then followed by 2.5 milliliters of distilled water, and then blend the mixture on high speed for about 1 hour to form a uniform pasty mass. Thereafter, the mixture is ready for extruding. To do so, extrude the dough-like material through any desirable die cast machine to form spaghetti like strands of any

diameter and length under a hydraulic pressure of about 3000 to 4000 psi. After which, the spaghetti-like strands should be cut into individual equal lengths ranging from 5 to 10 milliliters in diameter. Thereafter the cut cyndrical grains should be cured in an oven at 50 to 60 Celsius for about 3 to 5 days. Thereafter, the grains can be placed loosely into any gun cartridge, casing, ect. Note: if desired, an alternate process can be used to from various sized grains. To do so, replace the ethyl alcohol with acetone or ether, and then blend the same amount ingredients until the bulk of the solvent evaporates. Now, The size of the granules is dependant on how long you continue to blend the mixture once the original bulky paste has formed, and the speed at which your blending takes place. The longer you continue to blend the mixture, the more solvent evaporates. The more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste, the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the paste, on low speed until the mixture is near dryness. Either way, once your desired granules have formed, stop the blending operation, and then allow the granules to cure in an oven at 60 Celsius until completely dry. The grains can be separated into their various sizes using the desired screens or mesh. To use the grains, simply place them (loosely) into any desirable shell casing, gun cartridge, casing, ect., in the usual manner.

Burn rate: Average.
Chamber pressure: 47,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***86% nitrocellulose, 10% dinitrotoluene, 3% dibutylphthalate, 1% diphenylamine***
Classification: Deflagrating explosive (classified as explosive).
Use: Used in ammunition for a wide variety, but primarily large caliber weapons and not infantry weapons.

04-02-011B: Nitrocellulose gun propellant (US ARMY M6 propellant), with flash suppression addictive:
This mixture is identical to the 05-02-011A, but 1 part potassium sulfate is added per 100 parts of mixture. Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer in the normal fashion, place 150 to 200 milliliters of 95% ethyl alcohol, followed by ***413 grams of nitrocellulose of 13% nitrogen conten*t**, followed by ***47.5 grams of dinitrotoluene***, followed by ***14.3 grams of dibutylphthalate***, followed by ***4.8 grams of diphenylamine***, followed by ***4.8 grams of anhydrous potassium sulfate,*** and then followed by 2.5 milliliters of distilled water, and then blend the mixture on high speed for about 1 hour to form a uniform pasty mass. Thereafter, the mixture is ready for extruding. To do so, extrude the dough-like material through any desirable die cast machine to form spaghetti like strands of any diameter and length under a hydraulic pressure of about 3000 to 4000 psi. After which, the spaghetti-like strands should be cut into individual equal lengths ranging from 5 to 10 milliliters in diameter. Thereafter the cut cyndrical grains should be cured in an oven at 50 to 60 Celsius for about 3 to 5 days. Thereafter, the grains can be placed loosely into any gun cartridge, casing, ect. Note: if desired, an alternate process can be used to from various sized grains. To do so, replace the ethyl alcohol with acetone or ether, and then blend the same amount ingredients until the bulk of the solvent evaporates. Now, The size of the granules is dependant on how long you continue to blend the mixture once the original bulky paste has formed, and the speed at which your blending takes place. The longer you continue to blend the mixture, the more solvent evaporates. The more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste, the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the paste, on low speed until the mixture is near dryness. Either way, once your desired granules have formed, stop the blending operation, and then allow the granules to cure in an oven at 60 Celsius until completely dry. The grains can be separated into their various sizes using the desired screens or mesh. To use the grains, simply place them (loosely) into any desirable shell casing, gun cartridge, casing, ect., in the usual manner.

Burn rate: 4.7 inches per second at room temperature at 35,000 psi (average burn rate and chamber pressure).
Chamber pressure: High
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***85% nitrocellulose, 10% dinitrotoluene, 3% dibutylphthalate, 1% diphenylamine, 1% potassium sulfate***
Classification: Deflagrating explosive (classified as explosive).
Use: Used in ammunition for a wide variety, but primarily large caliber weapons and not infantry weapons.

04-02-011C: Nitrocellulose gun propellant (former US Navy propellant—pyro propellant):

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer in the normal fashion, place 150 to 200 milliliters of 95% ethyl alcohol, followed by ***455 grams of nitrocellulose of 12% nitrogen conten*t**, followed by ***5 grams of diphenylamine***, and then followed by 5 milliliters of distilled water, and then blend the mixture on high speed for about 1 hour to form a uniform pasty mass. Thereafter, the mixture is ready for extruding. To do so, extrude the dough-like material through any desirable die cast machine to form spaghetti like strands of any diameter and length under a hydraulic pressure of about 3000 to 4000 psi. After which, the spaghetti-like strands should be cut into individual equal lengths ranging from 5 to 10 milliliters in diameter. Thereafter the cut cyndrical grains should be cured in an oven at 50 to 60 Celsius for about 3 to 5 days. Thereafter, the grains can be placed loosely into any gun cartridge, casing, ect. Note: if desired, an alternate process can be used to from various sized grains. To do so, replace the ethyl alcohol with acetone or ether, and then blend the same amount ingredients until the bulk of the solvent evaporates. Now, The size of the granules is dependant on how long you continue to blend the mixture once the original bulky paste has formed, and the speed at which your blending takes place. The longer you continue to blend the mixture, the more solvent evaporates. The more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste, the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the paste, on low speed until the mixture is near dryness. Either way, once your desired granules have formed, stop the blending operation, and then allow the granules to cure in an oven at 60 Celsius until completely dry. The grains can be separated into their various sizes using the desired screens or mesh. To use the grains, simply place them (loosely) into any desirable shell casing, gun cartridge, casing, ect., in the usual manner. Note: potassium sulfate can be added in the ratio of 1 part potassium sulfate per 100 grams of propellant for flash suppressing.

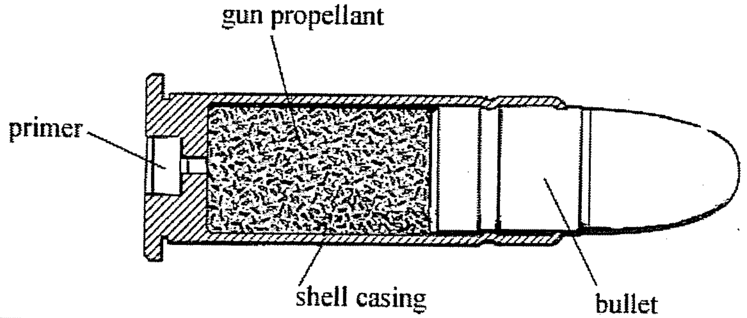
Burn rate: Average.
Chamber pressure: N/A
Muzzle Velocity: 1590 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***99% nitrocellulose, 1% diphenylamine***
Classification: Deflagrating explosive (classified as explosive).
Use: Formerly used in ammunition for naval ship guns.

04-02-012A: Standard high performance nitrocellulose gun propellant:
Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***670 grams of high nitrogen content nitrocellulose*** (dry basis, but moistened with 95% ethyl alcohol), followed by a nitroglycerine solution prepared by adding and dissolving ***165 grams of nitroglycerine*** into 170 milliliters of acetone, followed by ***15 grams of 2-nitrodiphenylamine***, and then followed by 250 milliliters of 95% ethyl alcohol and 300 milliliters of acetone. Thereafter blend the mixture for about 30 minutes to moderate speed until a paste forms. Thereafter add in ***165 grams of polyvinyl nitrate***, in 20-gram portions over a period of about 30 minutes with rapid blending of the pasty mass. After the addition of the polyvinyl nitrate, continue to blend the mixture for about 5 hours at room temperature. Now, the paste needs to be extruded through a die cast machine under pressure of 2500 to 3000 psi to form spaghetti-like strands. The strands can range from 6 to 12 inches in length, and the diameter should range from 5 to 10 millimeters in diameter. Thereafter, place the strands on a shallow tray and allow them to thoroughly air-dry. Thereafter, cut the strands into pieces ranging from 3 to 8 millimeters in length, and then place the pieces into a large container filled with water and then heat and soak the strands at 55 Celsius for about 96 hours. Afterwards, remove the grains, and then allow grains to thoroughly air-dry, by blowing a current of air over the surface of them. Thereafter, the grains are ready for use. To use, the grains simply need to be placed loosely, into any desirable gun chamber.

Burn rate: Rapid.
Chamber pressure: 60,000 psi
Average muzzle velocity during field tests (6.2 kilogram warhead using 7.85 kilograms of propellant): 1600 meters per second at 20 Celsius.
Chamber pressure: High
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***66% nitrocellulose, 16% nitroglycerine, 16% polyvinyl nitrate, 1% 2-nitrodiphenyl, 1% impurities***
Classification: Deflagrating explosive (classified as explosive).
Use: Used to propel tank-fired projectiles, such as the US Army's M1 Abraham's 120-millimeter gun, for example.

04-02-013A: Standard high performance nitrocellulose "double base" smokeless powder with reduced flash:
Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***250 grams of high nitrogen content nitrocellulose*** (dry basis but containing 100 milliliters of water, about 71% nitro cotton, commercially available or simply made by mixing 100 milliliters of water with 250 grams of nitrocellulose), followed by ***150 grams of nitroglycerine,*** followed by 165 milliliters of acetone, ***30 grams of barium nitrate***, then followed by ***50 grams of ethyl abietate,*** followed by ***10 grams of potassium nitrate***, and then followed by ***3.75 grams diphenylamine.*** Thereafter blend the mixture for about 30 minutes on moderate speed until a paste forms. Thereafter, continue to blend the mixture on high for about 2 hours to allow some of the solvent to evaporate. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 37,000 psi (estimated).
Muzzle Velocity: 1800 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50.6% nitrocellulose, 30% nitroglycerine, 10% ethyl abietate, 6% barium nitrate, 2% potassium nitrate, 0.76% diphenylamine, 0.64% residue***
Classification: Deflagrating explosive (classified as explosive).
Use: Formerly used in military ammunition of a wide variety.

Standard bullet design



04-02-014A: Standard high performance nitrocellulose (high nitroglycerine content) smokeless powder with reduced flash:
Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***750 grams of nitroglycerine***, followed by 750 milliliters of acetone, followed by ***250 grams of high nitrogen content (13%),*** followed by ***50 grams of lycopodium***, and then followed by ***20 grams of urea***. Thereafter blend the mixture for about 30 minutes on moderate speed until a paste forms. Thereafter, continue to blend the mixture on high for about 5 hours to allow some of the solvent to evaporate. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 43,000 psi (estimated).
Muzzle Velocity: 2050 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***70% nitroglycerine, 23% nitrocellulose, 5% lycopodium, 2% urea***

Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo.

04-02-014B: Standard high performance nitrocellulose (high nitroglycerine content) smokeless powder with reduced flash (modified using dinitrobenzene):
Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***750 grams of nitroglycerine***, followed by 750 milliliters of acetone, followed by ***250 grams of high nitrogen content (13%) nitrocellulose,*** followed by ***50 grams of lycopodium***, and then followed by ***20 grams of dinitrobenzene***. Thereafter blend the mixture for about 30 minutes on moderate speed until a paste forms. Thereafter, continue to blend the mixture on high for about 5 hours to allow some of the solvent to evaporate. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 39,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***70% nitroglycerine, 23% nitrocellulose, 5% lycopodium, 2% dinitrobenzene***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo.

04-02-015A: High performance nitrocellulose (high nitroglycerine content) smokeless powder with reduced flash (modified using dinitrobenzene):
Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***275 grams of nitroglycerine***, followed by 275 milliliters of acetone, followed by ***150 grams of high nitrogen content (13%) nitrocellulose,*** followed by ***50 grams of Vaseline***, and then followed by ***25 grams of camphor***. Thereafter blend the mixture on high for about 2 hours to allow some of the solvent to evaporate and to form a paste. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 29,000 psi (estimated).
Muzzle Velocity: 950 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***55% nitroglycerine, 30% nitrocellulose, 10% Vaseline, 5% camphor***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo.

04-02-016A: High performance nitrocellulose smokeless powder with reduced flash:
Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***150 grams of nitroglycerine***, followed by 175 milliliters of acetone, followed by ***300 grams of average nitrogen content (12 to 13%) nitrocellulose,*** followed by ***25 grams of diamyl phthalate***, and then followed by ***25 grams of mineral jelly***. Thereafter blend the mixture on high for about 2 hours to allow some of the solvent to evaporate and to form a paste. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry. The grains can be dusted with graphite if desired.
Burn rate: Rapid.

Chamber pressure: 39,000 psi (estimated).
Muzzle Velocity: 1550 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***60% nitrocellulose, 30% nitroglycerine, 5% diamyl phthalate, 5% mineral jelly***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo.

04-02-017A: High performance nitrocellulose smokeless powder:
This procedure is similar to 05-02-015A, however the camphor is replaced by olive oil, and the nitroglycerine is also reduced. Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***200 grams of nitroglycerine***, followed by 220 milliliters of acetone, followed by ***250 grams of high nitrogen content (13%) nitrocellulose,*** followed by ***12.5 grams of Vaseline***, and then followed by ***12.5 grams of olive oil.*** Thereafter blend the mixture on high for about 2 hours to allow some of the solvent to evaporate and to form a paste. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 43,000 psi (estimated).
Muzzle Velocity: 2100 feet per second (estimated).
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.6% nitrocellulose, 42.1% nitroglycerine, 2.6% Vaseline, 2.6% olive oil, 0.1% impurities***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo.

04-02-017B: High performance nitrocellulose smokeless powder (fortified with barium tartrate burn enhancer):
Into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, place ***200 grams of nitroglycerine***, followed by 220 milliliters of acetone, followed by ***250 grams of high nitrogen content (13%) nitrocellulose,*** followed by ***12.5 grams of Vaseline***, followed by ***12.5 grams of olive oil,*** thereafter, add in ***4.5 grams of potassium tartrate***, and then followed by ***20 grams of barium tartrate.*** Thereafter blend the mixture on high for about 2 hours to allow some of the solvent to evaporate and to form a paste. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 37,000 psi (estimated).
Muzzle Velocity: 1800 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50% nitrocellulose, 40% nitroglycerine, 4% barium tartrate, 2.5Vaseline, 2.6% olive oil, 0.90% potassium tartrate, 0.1% mixed balance***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo.

04-02-018A: High performance nitrocellulose smokeless powder containing diethyldiphenylcarbamide burn enhancer:
As in the usual manner, place into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, ***375 grams of nitrocellulose*** (average nitrogen content), followed by ***125 grams of nitroglycerine,*** followed immediately there by with 140 milliliters of acetone, followed by ***25 grams of diethyldiphenhylcarbamide.*** Thereafter blend the mixture on high for about 2 hours to allow some of the solvent to evaporate and to form a paste. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 41,000 psi (estimated).
Muzzle Velocity: 2100 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50% nitrocellulose, 40% nitroglycerine, 4% barium tartrate, 2.5Vaseline, 2.6% olive oil, 0.90% potassium tartrate, 0.1% mixed balance***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo. Can also be used in heavy shell ammunition.

04-02-018B: High performance nitrocellulose smokeless powder with potassium lactate stabilizer:
As in the usual manner, place into a suitable beaker or any desirable mixing container, equipped with large capacity motorized stirrer in the usual manner, ***349.4 grams of nitrocellulose*** (average nitrogen content), followed by ***115.6 grams of nitroglycerine,*** followed immediately there by with 125 milliliters of acetone, followed by ***25 grams of Vaseline,*** and then followed by ***10 grams of potassium lactate.*** Thereafter blend the mixture on high for about 2 hours to allow some of the solvent to evaporate and to form a paste. Now, the paste needs to be extruded through a die cast machine under a pressure of 3000 to 4000 psi to form spaghetti-like strands in the usual manner. The strands can range in any desired length. The strands should then be evenly cut into pieces of any desired length or size, ect. Thereafter, the grains should be cured at room temperature or in an oven at moderate temperature until thoroughly dry.
Burn rate: Rapid.
Chamber pressure: 39,000 psi (estimated).
Muzzle Velocity: 2050 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***69.88% nitrocellulose, 23.12% nitroglycerine, 5% Vaseline, 2% potassium lactate***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used with satisfactory results in riffle and pistol ammo. Can also be used in heavy shell ammunition.

04-02-019A: High performance nitrocellulose smokeless powder (utilizing the "Schultze" process):
Into a suitable mixing bowl, equipped with motorized stirrer, place ***208 grams of nitrocellulose***, and then add in 112 milliliters of warm water. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, place this blended mixture into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, and then add in ***8 grams of starch***, followed by ***12 grams of paraffin oil***, followed by ***48 grams of barium nitrate***, and then followed by ***12 grams of potassium nitrate***. Thereafter, tumble the mixture on moderate speed for about 3 hours. Note: you should use a mill machine utilizing edge runners for proper mixing. Second note: during the milling operation, you need to spray in, a few sprays of warm water, several times during the 3 hour milling process to keep the mixture moist. After the three-hour milling operation, place the mixture into a suitable beaker or similar container, and then add in 50 millimeters of 95% ethyl alcohol, and 15 milliliters if acetone, and then manually blend the mixture for about 5 minutes. Thereafter, the mixture is ready for pressing. To do so, the mixture needs to be pressed, using a press machine similar to the ones used to crush fruit to extract juice, but in this case, to abstract liquids from the milled mixture. After the mixture has been "squeezed", it is ready for use. To use, the mixture should be pressed through any die cast machine utilizing 3 to 5 millimeter holes, into spaghetti like strands of 150 to 300 millimeters in length. Thereafter, cut the strands into lengths of 5 to 6 millimeters in length, and then cure the grains in an oven at ordinary temperature. Thereafter, the grain is ready for pouring into any desirable shell casing, ect.

Burn rate: Rapid.
Chamber pressure: 38,000 psi (estimated).
Muzzle Velocity: 1900 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***72.22% nitrocellulose, 16.66% barium nitrate, 4.16% potassium nitrate, 4.16% paraffin oil, 2.77% starch, 0.03% mixed residues***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in riffle and pistol ammo, but more preferably in shotgun shells.

04-02-020A: High performance nitrocellulose smokeless powder:
Into a suitable empty ball mill, place ***300 grams of nitrocellulose***, followed by 150 milliliters of a 50% ethyl alcohol 50% ether solution. Thereafter, tumble the mixture on moderate speed for about 30 minutes. Thereafter, add in ***6 grams of dinitrotoluene***, and then continue to tumble the mixture for about 10 minutes. Now, heat the ball mill, using any desired means to about 70 Celsius, and then add in ***30 grams of black powder***. Thereafter, tumble the mixture at 70 Celsius at 500 RPM for about 2 hours. After 2 hours, the heat should be removed, and the mixture should be tumbled at 250 RPM for about 20 to 30 minutes until the mixture cools to room temperature. Thereafter, the tumbled powder is ready for use. To use, the mixture needs to be moistened with ether, and then pressed through any die cast machine utilizing 3 to 5 millimeters holes, into spaghetti like strands of 150 to 300 millimeters in length. Thereafter, cut the strands into lengths of 5 to 6 millimeters in length, and then cure the grains in an oven at ordinary temperature. Thereafter, the grain is ready for pouring into any desirable shell casing, ect.
Burn rate: Rapid.
Chamber pressure: 41,000 psi (estimated).
Muzzle Velocity: 2000 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***89.28% nitrocellulose, 8.92% black powder, 1.78% dinitrotoluene binder, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in riffle and pistol ammo, but more preferably in shotgun shells.

04-02-021A: High performance nitrocellulose smokeless powder (military grade):
Into a suitable beaker, place ***185 grams of nitrocellulose***, followed by 40 millimeters of 95% ethyl alcohol. Thereafter, manually blend the mixture for about 10 minutes. Thereafter, place this mixture into a suitable mixing drum (kneading machine), and then carefully add in, in small portions at a time, ***255 grams of nitroglycerine***, and then gently blend the mixture for about 3 hours. Thereafter, add in ***300 grams of nitroguanidine***, followed by ***8 grams of methyl diphenylurea***, and then followed by 86 milliliters of acetone, and then continue to blend the mixture for about 1 hour. Now, place the mixture onto a shallow tray, and allow it to cure at room temperature for about 8 days. Thereafter, the cured mass needs to be extruded through any die cast machine into spaghetti like strands of 300 millimeters in length by 2 to 3 millimeters in diameter. Thereafter, cut the strands into 2 to 3 millimeters length. Now, place these cut grains into a suitable empty ball mill, and then begin rotating the device at about 100 RPM at 50 Celsius. Shortly thereafter, spray into the rotating device, 50 milliliters of a pre-prepared solution made by dissolving 1 gram of dibutyl phthalate into 50 millimeters of ethyl alcohol. After the spraying, allow the mixture to rotate for about 5 minutes. Thereafter, repeat this spraying process three more times with three additional solutions of dibutyl phthalate. Now, spray into the rotating device, 50 milliliters of a pre-prepared solution made by adding 1 gram of N,N'-diethyl-carbanilide into 50 milliliters of ethyl alcohol, and then continue to rotate the mixture for about 5 minutes after the spraying. Thereafter, place the mixture onto a shallow tray or pan, and then cure it in an oven at ordinary temperature for about 8 hours. Thereafter, the grain is ready for packing into any desirable shell casing, ect.
Burn rate: Rapid.
Chamber pressure: 37,000 psi (estimated).
Muzzle Velocity: 1900 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***40.1% nitroguanidine, 34.09% nitroglycerine, 24.73% nitrocellulose, 1.06% methyl diphenylurea, 0.02% mixed residue***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in high performance ammunition.

04-02-021B: High performance nitrocellulose smokeless powder (military grade):
Into a suitable mixing bowl, equipped with motorized stirrer, place ***265 grams of nitrocellulose***, followed by ***180 grams of nitroglycerine***, followed by ***50 grams of nitroguanidine***, and then followed by ***5 grams of dimethyl diphenylurea.*** Thereafter, add in 75 milliliters of acetone, and then blend the mixture for about 45 minutes on high speed. Thereafter, the mass needs to be extruded through any die cast machine into spaghetti like strands of 150 millimeters in length by 1 to 2 millimeters in diameter. Thereafter, cut the strands into 2 to 3 millimeters length, and then cure the grains in an oven for 24 hours at ordinary temperature or until dry. Now, place these cured grains into vertical rotating pan, ball mill, or any suitable rotating devices, and then begin rotating the device at about 100 RPM at room temperature. Shortly thereafter, add in ***5 grams of diethyl dipehnylurea***, and then followed by 50 grams of 95% ethyl alcohol. Thereafter, continue to rotate the mixture for about 2 hours at room temperature. Finally, cure the rotating grains in an oven at ordinary temperature for about 3 hours. Thereafter, the grain is ready for packing into any desirable shell casing, ect.
Burn rate: Rapid.
Chamber pressure: 54,000 psi (estimated).
Muzzle Velocity: 2150 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.47% nitrocellulose, 35.64% nitroglycerine, 9.9% nitroguanidine, 1.98% diethyl diphenylamine, 0.01% residues***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in high performance ammunition.

04-02-022A: High performance nitrocellulose gun propellant (potassium nitrate fortified):
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***300 gram of dibutyl phthalate***, and then add in ***6 grams of ethyl cellulose***. Thereafter, tumble the mixture at low RPM for about 10 minutes. Thereafter, add in ***6 grams of diphenylamine***, followed by 720 grams of 99% isopropyl alcohol, and then followed by ***8 grams of calcium carbonate***. Thereafter, continue to tumble the mixture at 150 RPM for about 30 minutes. Thereafter, add in ***1200 grams o potassium nitrate***, and then continue to tumble the mixture at about 50 RPM for about 12 hours. After 12 hours, place the mixture into a clean mixing bowl, equipped with motorized sitter in the usual manner, and then add in ***2000 grams of nitrocellulose***, followed by ***24 grams of dinitrotoluene***, and the blend the mixture on moderate speed for until the bulk of the solvent evaporates. Note: a vacuum can be used to speed up the process, and recover the solvent. Thereafter, heat the mixture to 50 Celsius, and then continue to blend the mixture for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded through any desired die cast machine under high pressure to form spaghetti like strands of 2 to 3 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, cut the strands into grains of 2 to 3 millimeters in length. Thereafter, the grains need to be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid.
Chamber pressure: 39,000 psi (estimated).
Muzzle Velocity: 1850 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***56.43% nitrocellulose, 33.86% potassium nitrate, 8.46% dibutyl phthalate, 0.677% dinitrotoluene, 0.22% calcium carbonate, 0.168% ethyl cellulose, 0.168% diphenylamine, 0.017% mixed balance***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in high performance ammunition.

04-02-023A: High performance nitrocellulose gun propellant (with TNT modifier):

Into a suitable mixing bowl, equipped with motorized stirrer, place 500 milliliters of a 50/50 mixture of 95% ethyl alcohol and diethyl ether. Thereafter, add in ***356 grams of nitrocellulose***, and the blend the mixture on moderate speed for about 20 minutes. Thereafter, heat the mixture to 50 Celsius, and then add in ***33 grams of TNT***, followed by ***6 grams of dinitrotoluene***, and then followed by ***5 grams of diphenylamine***. Thereafter, blend the mixture at 50 Celsius, for about 1 hour. Now, carefully add in ***100 grams of nitroglycerine***, and then continue to blend the mixture at 50 Celsius for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded through any desired die cast machine under high pressure to form spaghetti like strand of 2 to 3 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, cut the strands into grains of 2 to 3 millimeters n length. Thereafter, the grains need to be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid.
Chamber pressure: 40,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***71.2% nitrocellulose, 20% nitroglycerine, 6.6% TNT, 1.2% dinitrotoluene***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in high performance ammunition.

04-02-024A: High performance nitrocellulose gun propellant:

Into a suitable mixing bowl, equipped with motorized stirrer, place ***50 grams of nitrocellulose of low nitrogen content***, and then add in 300 milliliters of ethyl acetate. Thereafter, manually blend the mixture to dissolve the bulk of the nitrocellulose. Thereafter, add in 160 milliliters of benzene, and then continue to blend the mixture for about 10 minutes. Now, into a separate container, place ***350 grams of nitroglycerine***, and then add in 450 milliliters of benzene, and manually blend the mixture to dissolver the nitroglycerine. Thereafter, into a third clean container, place 150 grams of nitrocellulose solution, followed by 350 grams of the nitroglycerine solution, and then blend the combined mixture for about 1 hour. Into a fourth container, place 465 grams of the nitrocellulose/nitroglycerine solution, and then add in ***35 grams of diamyl phthalate***, and then blend the mixture for about 50 minutes. Now, into a clean ball mill, or rotating barrel, place the mixture as just prepared, and then ad in ***500 grams of nitrocellulose***, of high nitrogen content, and then heat the contents to 50 Celsius, and then rotate the mixture at 250 RPM for about 2 to 4 hours to drive off the bulk of the solvent. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded through any desired die cast machine under high pressure to form spaghetti like strand of 2 to 3 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, cut the strands into grains of 2 to 3 millimeters in length. Thereafter, the grains need to be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid (chamber pressure: 45,000 psi at .22 caliber riffle ammo).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***68% nitrocellulose, 27% nitrocellulose, 4% diamyl phthalate, 1% residue***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in high pistol and shotgun ammo.

04-02-025A: High performance nitrocellulose gun propellant:

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***150 grams of nitrocellulose***, and then add in 600 milliliters of cold water. Thereafter, tumble the mixture for a bout 30 minutes. Thereafter, add in ***38.5 grams of nitroglycerine***, followed by 38.5 grams of benzene, followed by ***3.85 grams of dinitrotoluene***, and then followed by 25 grams of acetone. Thereafter, tumble the mixture fro about 50 minuets at moderate RPM. Thereafter, heat the mixture to about 65 Celsius, and then continue to tumble the mixture for several hours to remove some of the solvent. Thereafter, place the entire mixture onto a shallow pan or tray, and allow it to dry until fine paste is obtained. Thereafter, place the semi dry material back into the same ball mill, and then continue to tumble the mixture at moderate RPM to form a uniform power grain. Thereafter, the mixture is ready for use. To use, the mixture should be moistened with a little 95% ethyl alcohol to form a mild paste. Thereafter, the mixture needs to be extruded through any desired die cast machine under high pressure to form spaghetti like strands of about 3 to 4 millimeters in diameter by about 150 millimeters in length. Thereafter, the strands should be cut into small grains of 5 millimeters in length. Finally, the grains need to be cured in an oven at moderate temperature in the usual manner.
Burn rate: Rapid.
Chamber pressure: 41,000 psi (estimated).
Muzzle Velocity: 2000 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***77.98% nitrocellulose, 20.01% nitroglycerine, 2% dinitrotoluene, 0.01% mixed residues***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in high pistol and shotgun ammo.

04-02-026A: High performance nitrocellulose gun propellant:

Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 90 milliliters of ether, followed by 90 milliliters of 95% ethyl alcohol, followed by ***400 grams of nitrocellulose***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***50 grams of finely ground cornstarch***, followed by ***50 grams of dinitrotoluene*** (any suitable isomer), and then followed by ***2.5 grams of diphenylamine***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture at this temperature for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded from any desired die cast machine to form spaghetti like strands ranging from 100 to 150 millimeters in length, by 1 to 2 millimeters in diameter. Thereafter these strands simply need to be cut into lengths ranging from 1 to 5 millimeters. The resulting grains should then be coated with a thin layer of graphite powder, and then cured in oven at ordinary temperatures until dry and hard.
Burn rate: Rapid.
Chamber pressure: 35,000 psi (estimated).
Muzzle Velocity: 950+ feet per second.
Primary Attribute: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***79.6% nitrocellulose, 9.95% corn starch, 9.95% dinitrotoluene, 0.49% diphenylamine, 0.01% graphite***
Classification: Deflagrating explosive (classified as explosive).
Use: Suitable composition for use in canons and howitzers.

04-02-027A: High performance nitrocellulose gun propellant:

Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 90 milliliters of ether, followed by 90 milliliters of 95% ethyl alcohol, followed by ***372.5 grams of nitrocellulose***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***25 grams of mononitroxylene***, followed by ***100 grams of dinitrobenzene***, and then followed by ***2.5 grams of diphenylamine***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture at this temperature for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded from any desired die cast machine to form spaghetti like strands ranging from 100 to 150 millimeters in length, by 1 to 2 millimeters in diameter. Thereafter these strands simply need to be cut into lengths ranging from 1 to 5 millimeters. The resulting grains should then be coated with a thin layer of graphite powder, and then cured in oven at ordinary temperatures until dry and hard.
Burn rate: Rapid.
Chamber pressure: 41,000 psi (estimated).
Muzzle Velocity: 2000 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***74.5% nitrocellulose, 20% dinitrobenzene, 5% mononitroxylene, 0.50% diphenylamine***
Classification: Deflagrating explosive (classified as explosive).

Use: Suitable composition for use in canons and howitzers.

04-02-028A: High performance "fleshless" nitrocellulose gun propellant:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 90 milliliters of ether, followed by 90 milliliters of 95% ethyl alcohol, followed by ***425 grams of nitrocellulose***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***50 grams of dinitrotoluene***, followed by ***12.5 grams of triethylene glycol***, and then followed by ***12.5 grams of caprylic acid***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture at this temperature for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded from any desired die cast machine to form spaghetti like strands ranging from 100 to 150 millimeters in length, by 1 to 2 millimeters in diameter. Thereafter these strands simply need to be cut into lengths ranging from 1 to 5 millimeters. The resulting grains should then be coated with a thin layer of graphite powder, and then cured in oven at ordinary temperatures until dry and hard.
Burn rate: Typical.
Chamber pressure: 38,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***85% nitrocellulose, 10% dinitrotoluene, 2.5% triethylene glycol, 2.5% caprylic acid***
Classification: Deflagrating explosive (classified as explosive).
Use: Suitable composition for use in small arms weapons.

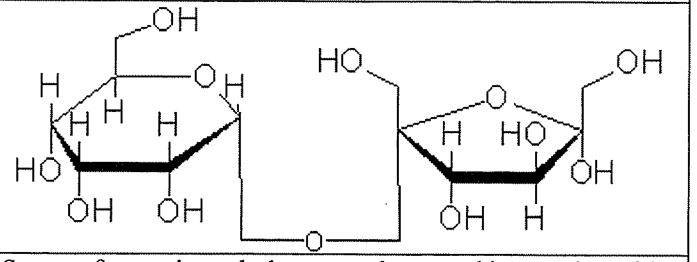
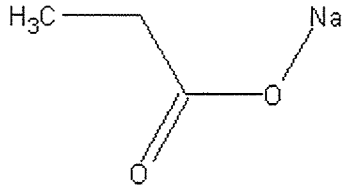
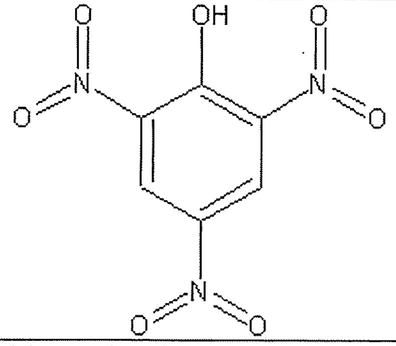
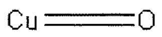
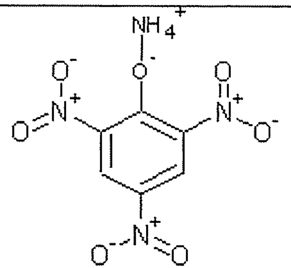
04-02-028B: High performance "fleshless" nitrocellulose gun propellant:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 90 milliliters of ether, followed by 90 milliliters of 95% ethyl alcohol, followed by ***400 grams of nitrocellulose***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***75 grams of dinitrotoluene***, and then followed by ***25 grams of propylene glycol caprylate***. Thereafter, gently heat the mixture to about 40 to 60 Celsius, and then blend the mixture at this temperature for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be extruded from any desired die cast machine to form spaghetti like strands ranging from 100 to 150 millimeters in length, by 1 to 2 millimeters in diameter. Thereafter these strands simply need to be cut into lengths ranging from 1 to 5 millimeters. The resulting grains should then be coated with a thin layer of graphite powder, and then cured in oven at ordinary temperatures until dry and hard.
Burn rate: Typical.
Chamber pressure: 42,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***80% nitrocellulose, 15% dinitrotoluene, 5% triethylene glycol caprylate***
Classification: Deflagrating explosive (classified as explosive).
Use: Suitable composition for use in small arms weapons.

04-02-029A: High performance "clean burning" nitrocellulose smokeless gun propellant:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 3500 milliliters of cold water, and then add in ***433.5 grams of nitrocellulose***. Thereafter, blend the mixture for about 5 minutes to form a slurry. Thereafter, heat the slurry mixture to 55 Celsius, and thereafter, add in ***28.9 grams of standard animal glue***. Thereafter blend the mixture at 55 Celsius for about 15 minutes. Thereafter, add in ***31.5 grams of butyl stearate***, followed by ***5 grams of ethyl centralite***, followed by ***5 grams of basic lead carbonate***, and then followed by ***5 grams of potassium sulfate***. Thereafter, place them mixture into a suitable distillation apparatus, or vacuum apparatus, and remove the ethyl acetate under vacuum or by distillation at about 99 Celsius. Once the ethyl acetate has been removed, remove the heat source and/or vacuum and then place the remaining mixture into a suitable beaker, and allow it to stand over night. Thereafter, blend the mixture on high speed for about 2 hours. Thereafter, filter-off the insoluble mass, or remove the water by pressing it out of the mixture. Thereafter, place the collected mass onto a shallow pan or tray, and allow it to thoroughly air dry. Thereafter, the mixture is ready for use. To use, the mixture can be pulverized manually and the resulting grains can then be separated using any desired sieves. If desired, the dried mass can be moistened with a little alcohol, and then extruded from any desired die cast

machine to form spaghetti like strands. Thereafter these strands simply need to be cut into lengths ranging from 1 to 5 millimeters, and then cured in oven at ordinary temperatures until dry and hard. Note: do not coat with graphite.
Burn rate: Typical.
Chamber pressure: 37,000 psi (estimated).
Muzzle Velocity: 1500 feet per second.
Primary Attribute: Smokeless and flashless.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***85% nitrocellulose, 6.18% butyl stearate, 5.67% animal glue, 0.98% ethyl centralite, 0.98% basic lead carbonate, 0.98% potassium sulfate, 0.21% impurities***
Classification: Deflagrating explosive (classified as explosive).
Use: Suitable composition for use in small arms weapons.

Section 3: Miscellaneous gun propellants

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose)**
	 OH H O H H H H HO OH OH HO O OH H HO OH OH H O
	Sucrose forms nice colorless crystals, or a white powder, with a sweet taste. Sucrose decomposes when heated to 180 Celsius, but carmelization begins at lower temperatures. The crystals are very soluble in water, but relatively insoluble in most solvents.
79. Sodium Propionate	**80. Picric Acid**
	
Forms transparent crystals, or granules. The propionate is soluble in water, but relatively insoluble in alcohol and other solvents.	Forms yellowish, to pale-yellowish crystals, granules, or powder. The crystals have a melting point of 123 Celsius, and explode when heated to 300 Celsius. Picric acid is insoluble in the usual organic solvents, and water. The crystals are toxic, so users should wear proper gloves when handling.
81. Copper-II-oxide	**82. Ammonium Picrate**
	 NH4+ O- O- O N+ O N+ O- O- N+ O
Forms a fine black to brownish-black powder. The powder is insoluble in water and all known solvents. It slowly dissolves in ammonia, and acids, but is soluble in cyanide solutions and ammonium carbonate solution.	Ammonium picrate forms bright yellow scales, or orthorhombic crystals, which are insoluble in water. The crystals explode easily from heat, shock, friction, fire, and percussion. Ammonium picrate is commonly used in priming compositions for bullets and the like, initiation compositions for blasting caps and detonators, high performance rocket propellants, and fireworks and other pyrotechnic compositions. Ammonium picrate should be stored submerged in kerosene.
	Method of Preparation 1: Bubble 3 grams of ammonia gas into 400 milliliters of benzene. Then, stir the mixture while slowly adding and dissolving 38 grams of finely divided (powdered) picric acid. Keep the reaction mixture at room

		temperature (a cold water bath may or may not be needed). While slowly adding the picric acid, bubble another 3 grams ammonia gas into the reaction mixture. After the addition of the ammonia gas and the picric acid, stir the solution for 2 hours at room temperature. The ammonium picrate will begin to separate shortly after the first couple of additions of the picric acid. After 2 hours, filter-off the ammonium picrate, wash with 500 milliliters of water, and then vacuum dry or air-dry the product. Do not use heat to dry the ammonium picrate.

- High Performance Miscellaneous Gun Propellants in this section -

1. 04-03-001A: High "heaving" action gun propellant suitable for artillery guns: *38% potassium chlorate, 33.3% sugar, 28.6% glycerin, 0.10% residue*	**2. 04-03-002B: Low "chamber pressure" gun propellant suitable for cannons:** *52.1% potassium perchlorate, 34.7% sodium propionate, 8.6% sulfur, 4.3% dextrin, 0.30% residue*
3. 04-03-003A: High performance chlorate gun propellant suitable for firearms: *59.9% potassium chlorate, 39% sugar, 1.1% residue*	**4. 04-03-004A: "Super" high performance gun propellant suitable for propelling projectiles to high altitudes:** *62.4% titanium hydride, 37.5% ammonium azide, 0.10% residue*
5. 04-03-004B: "Super" high performance gun propellant suitable for propelling projectiles to high altitudes (modified, stabilized): *61.9% titanium hydride, 37.2% ammonium azide, 0.79% diatomaceous earth, 0.11% impurities*	**6. 04-03-005A: Potassium perchlorate high performance gun propellant:** *76% potassium perchlorate, 14.5% epoxy resin, 9.5% aluminum*
7. 04-03-006A: Nitro coated high performance gun propellant containing picric acid: *43.1% barium nitrate, 34.4% picric acid, 7.1% potassium ferrocyanide, 7.1% wheat flour, 7.1% potassium chlorate, 1% lamp black, 0.20% nitro compounds*	**8. 04-03-007A: High performance sodium azide containing specialty gun propellant:** *66.8% sodium azide, 18.2% iron oxide, 15% copper oxide*
9. 04-03-008A: High performance nitrocellulose gun propellant (triple based): *60.77% nitroguanidine, 22.22% nitrocellulose, 10% nitroglycerine, 5% dibutyl phthalate, 1.66% 2-nitrodiphenylamine, 0.33% cryolite, 0.02% impurities*	**10. 04-03-008B: High performance nitrocellulose gun propellant (triple based):** *54.86% nitroguanidine, 20.06% nitrocellulose, 19.05% nitroglycerine, 4.51% dibutylphthalate, 1.5% nitrogiphenylamine, 0.02% mixed balance*
11. 04-03-009A: High performance ammonium perchlorate gun propellant: *46.87% ammonium perchlorate, 31.25% nitrocellulose, 17.96% wheat flour, 3.9% flours of sulfur, 0.02% impurities*	**12. 04-03-009B: High performance perchlorate based gun propellant:** *51.36% potassium perchlorate, 27.39% nitrocellulose, 13.01% wheat flour, 6.16% sulfur, 2.05% sodium azide, 0.03% impurities*
13. 04-03-009C: High performance chlorate based gun propellant: *66.66% potassium chlorate, 33.33% starch, 0.01% mixed balance*	**14. 04-03-010A: High performance nitroguanidine gun propellant:** *59% nitroguanidine, 21.57% nitrocellulose, 9.7% nitroglycerine, 4.85% dibutylphthalate, 3.23% cryolite, 1.61% 2-nitrodiphenylamine, 0.04% mixed balance*
15. 04-03-010B: High performance nitroguanidine gun propellant: *54.86% nitroguanidine, 20% nitrocellulose, 19% nitroglycerine, 4.4% dibutylphthalate, 1.5% 2-nitrodiphenylamine, 0.24% mixed residual balance*	**16. 04-03-011A: High performance barium nitrate gun propellant for small arms weapons:** *51% barium nitrate, 17% lead nitrate, 15% nitrocellulose, 9.5% soft wood charcoal, 7.5% sulfur*
17. 05-03-011B: High performance barium nitrate gun propellant for small arms weapons: *49.8% barium nitrate, 17.24% nitrocellulose, 15.32% potassium nitrate, 10.53% graphite, 7.08% sodium hypophosphite, 0.03% mixed balance*	**18. 05-03-012A: Specialty high performance ammonium picrate gun propellant:** *47% ammonium picrate, 30% barium nitrate, 23% potassium dichromate*
19. 05-03-013A: High performance ammonium picrate gun propellant: *52% potassium nitrate, 25% ammonium picrate, 10% sulfur, 10% corn starch, 3% soft wood charcoal*	**20. 05-03-014A: High performance barium nitrate gun propellant:** *43.95% barium nitrate, 43.95% pyroxyline, 6.59% nitro-naphthalene, 5.49% potassium nitrate, 0.02% mixed balance*
21. 05-03-014B: High performance barium nitrate gun propellant (sulfur induced): *61.22% pyroxyline, 24.48% barium nitrate, 10.2% potassium nitrate, 2.04% nitro-naphthalene, 2.04% sulfur, 0.02% mixed balance*	**22. 05-03-015A: High performance "smokeless powder" ammonium picrate gun propellant:** *68% ammonium picrate, 25% potassium dichromate, 7% potassium permanganate*

04-03-001A: High "heaving" action gun propellant suitable for artillery guns:
Into a suitable beaker or similar container, place 340 milliliters of water, followed by ***170 grams of glycerin***, and then followed by ***198 grams of sugar***. Thereafter, boil the mixture at 100 Celsius and stir until all the sugar dissolves. Once the sugar dissolves, remove the heat source, and allow the mixture to cool to room temperature. However, during the cool down period, when the temperature of mixture reaches about 50 Celsius, add in ***226 gram of potassium chlorate*** while rapidly stirring the mixture. After the addition of the potassium chlorate, continue to rapidly blend the mixture for about 2 hours. After 2 hours, pour the entire mixture onto a shallow pan, and allow it to thoroughly air-dry. Once it has, place the dried mass into mixing bowl, or blender equipped with plastic stir blade, followed by 150 milliliters of hexane, and then blend the mixture on moderate speed until 95% of the hexane evaporates. When this point is reached, stop the blending and then place the loose granules onto a shallow pan, and allow them to thoroughly air-dry. Once they have, the granules are ready for used. Note: not all the granules will be the same size, so they should be separated using the appropriate sieves.
Burn rate: Rapid.
Chamber pressure: 30,000 psi (estimated).
Muzzle Velocity: 950 feet per second.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***38% potassium chlorate, 33.3% sugar, 28.6% glycerin, 0.10% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in field cannons and artillery guns.

04-03-002B: Low "chamber pressure" gun propellant suitable for cannons:
Into a standard ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters of diameter, place ***300 gram of potassium perchlorate***, followed by ***200 grams of sodium propionate***, ***50 grams of flours of sulfur***, followed by ***25 grams of dextrin.*** Thereafter, tumble the mixture at 150 RPM for about 30 minutes. After 30 minutes, slowly add in, in the form of a spray, 50 milliliters of water while continuing to tumble the mixture at 150 RPM. After the water has all been added, continue to tumble the mixture at 150 RPM for about 1 hour at room temperature. After 1 hour, the mixture is ready. To use, it should be removed from the ball mill, and placed onto a shallow tray and allowed to air-dry for several days. Thereafter, the dried mass should be screened through any desirable mesh screen to form various grain sizes; however, a more convenient method of forming granules is to utilize the solvent evaporation technique. To do so, place the entire dried mass into any suitable mixing drum or blender, equipped with motorized stirrer equipped with plastic stir blade, and then add 150 milliliters of 95% alcohol, and then blend the mixture on moderate speed until the alcohol has evaporated to the point where only a wet paste remains. Now, once the paste has formed, continue mixing until the pasty mass begins to dry and form into tiny balls or granules—this granulation technique will proceed as the solvent evaporates to near dryness. The size of the granules is dependant on how long you continue to blend the mixture once the original bulky paste has formed, and the speed at which your blending takes place. The longer you continue to blend the mixture, the more solvent evaporates. The more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste, the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the paste, on low speed until the mixture is near dryness. Either way, once your desired granules have formed, stop the blending operation, and then allow the granules to cure in an oven at 60 Celsius until completely dry. To use the grains, simply place them (loosely) into any desirable shell casing, or they can be used directly in "black powder" muzzle loaded weapons.
Burn rate: Rapid.
Chamber pressure: 10,500 psi at 53 grains (22 caliber).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.1% potassium perchlorate, 34.7% sodium propionate, 8.6% sulfur, 4.3% dextrin, 0.30% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in pistols and shotguns, but mainly in cannons.

04-03-003A: High performance chlorate gun propellant suitable for firearms:
Into a standard ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters of diameter, place ***100 grams of regular granulated sugar,*** followed by ***150 grams of potassium chlorate***. Thereafter, tumble the mixture at 100 RPM for about 30 minutes. During the 30 minute tumbling process, prepare a solvent mixture by adding to a clean beaker or suitable container, containing a motorized stirrer with plastic stir blade, 100 milliliters of ordinary unleaded premium gasoline, followed by 100 milliliters of turpentine, followed by 100 milliliters of 95% ethyl alcohol or 100 milliliters of denatured alcohol, followed by 200 milliliters of water. Thereafter, moderately blend this solvent mixture for about 30 minutes. After the 20 minutes blending operation for the potassium chlorate/sugar mixture has been complete, add the potassium chlorate/sugar mixture to the solvent mixture previously

prepared and then blend the entire combined mixture for about 1 hour at moderate speed. After blending for about 1 hour, some of the solvent mixture will have evaporated. After blending for 1 hour, filter-off the insoluble mass, using either gravity filtration or preferably vacuum filtration, and then pace the filtered-off mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture for about 30 minutes at 150 RPM. After 30 minutes, place the tumbled mixture into a clean mixing bowl or blender, equipped with clean motorized stirrer with a plastic stir blade, and then add in 100 milliliters of hexane, and then blend the mixture until the bulk of the hexane has evaporated leaving behind a dough-like or "pasty" material. Now, as in the previous preparation, the more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste or "dough", the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the dough, on low speed until the mixture is near dryness. The various grain sizes can be separated using sieves of desired mesh.

Burn rate: Rapid.
Chamber pressure: 18,000 psi (estimated).
Muzzle Velocity: 900 feet per second.
Chamber pressure: Average
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***59.9% potassium chlorate, 39% sugar, 1.1% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in pistols, shotguns, and riffles.

04-03-004A: "Super" high performance gun propellant suitable for propelling projectiles to high altitudes:
Into a clean beaker or suitable container, containing a motorized stirrer with plastic stir blade, place 300 milliliters of hexane, followed by ***312 grams of titanium hydride***, followed by ***187.5 grams of ammonium azide***, and then gently blend this solvent mixture on low for about 30 minutes to form a uniform mixture. After blending for about 30 minutes, what you do then depends on what type of grain size your want. In typical operation, long cyndrical grains are preferred for use in anti-aircraft guns. To prepare these cyndrical grains, you should first continue to gently blend the mixture at room temperature until the bulk of the hexane has evaporated, and a pasty mass remains. When a pasty mass has been formed, place the paste into a typical extruding machine using 1 to 2.5 millimeter holes, and then extrude the paste through these holes under high pressure to form "spaghetti" like strands of propellant grain ranging up to 12 inches long. Afterwards, evenly cut these strands into lengths of 10 to 20 millimeters in length, and then cure these cyndrical grains at room temperature until they are thoroughly dry. You can also form grains of various sizes by continuing to blend the mixture until the bulk of the hexane has evaporated leaving behind a pasty material. Now, remember as in previous preparations, the more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste or "dough", the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the dough, on low speed until the mixture is near dryness. The various grain sizes can be separated using sieves of desired mesh. **Note: do not use this propellant mixture, regardless of grain shape or size, in standard gun casings using typical weapons, as exploding gun chambers may result. Specially designed guns utilizing extra thick walled gun chambers and gun barrels should be used.**

Burn rate: Rapid.
Chamber pressure: 53,000 to 65,000 psi in 12.9 millimeter guns
Average impetus: 850,000+
Average muzzle velocity: 15,000 feet per second for average diameter projectiles (calculated as flat earth with no air resistance).
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***62.4% titanium hydride, 37.5% ammonium azide, 0.10% residue***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in anti-aircraft guns of 12.9 to 40 millimeters in diameter to reach aircraft in excess of 50,000 feet altitude. May also be used to propel tank sabot projectiles of up to 130 millimeters in diameter. Can also be used to propel specially designed projectiles for use in shooting down satellites.

04-03-004B: "Super" high performance gun propellant suitable for propelling projectiles to high altitudes (modified, stabilized):

Into a clean beaker or suitable container, containing a motorized stirrer with plastic stir blade, place 300 milliliters of hexane, followed by ***312 grams of titanium hydride***, followed by ***187.5 grams of ammonium azide***, and then followed by ***4 grams of diatomaceous earth***, and then gently blend this solvent mixture on low for about 30 minutes to form a uniform mixture. After blending for about 30 minutes, what you do then depends on what type of grain size your want. In typical operation, long cyndrical grains are preferred for use in anti-aircraft guns. To prepare these cyndrical grains, you should first continue to gently blend the mixture at room temperature until the bulk of the hexane has evaporated, and a pasty mass remains. When a pasty mass has been formed, place the paste into a typical extruding machine using 1 to 2.5 millimeter holes, and then extrude the paste through these holes under high pressure to form "spaghetti" like strands of propellant grain ranging up to 12 inches long. Afterwards, evenly cut these strands into lengths of 10 to 20 millimeters in length, and then cure these cyndrical grains at room temperature until they are thoroughly dry. You can also form grains of various sizes by continuing to blend the mixture until the bulk of the hexane has evaporated leaving behind a pasty material. Now, remember as in previous preparations, the more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste or "dough", the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the dough, on low speed until the mixture is near dryness. The various grain sizes can be separated using sieves of desired mesh. **Note: do not use this propellant mixture, regardless of grain shape or size, in standard gun casings using typical weapons, as exploding gun chambers may result. Specially designed guns utilizing extra thick walled gun chambers and gun barrels should be used.**

Burn rate: Rapid.
Chamber pressure: Same as 04-03-004A
Average muzzle velocity: Same as 04-03-004A.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.9% titanium hydride, 37.2% ammonium azide, 0.79% diatomaceous earth, 0.11% impurities***
Classification: Deflagrating explosive (classified as explosive).
Use: Can be used in typical fashion as in 04-03-004A.

04-03-005A: Potassium perchlorate high performance gun propellant:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***380 grams of potassium perchlorate***, followed by ***47.5 grams of finely powdered aluminum***, followed by ***72.5 grams of Armstrong epoxy resin E-301-14***, and then thoroughly blend the mixture for about 10 to 15 minutes to form a uniform fluidized pasty mass. After the mixing process, the mixture is ready for pressing. To do so, it needs to be placed into a beaker of suitable container and gently heated to 180 Celsius. When the mixtures temperature reaches 180 Celsius, the hot mixture needs to be immediately placed into an extruding machine fitted with die cast holes ranging from 1.5 to 5 millimeters in diameter, depending on desired grain size, and extruded under a hydraulic pressure of 15,000 psi to form rods, or "spaghetti-like" strands ranging from 200 to 300 millimeters in length. Thereafter, the spaghetti strands should then immediately be cut into even pieces of 1.5 to 5 millimeter lengths, depending on desired grain size. Afterwards, the grains should be cured on shallow pan for a day or so. Thereafter, the grains are ready for loading into any desirable shell casing utilizing the normal techniques.

Burn rate: Rapid.
Chamber pressure: 21,000 psi (estimated).
Muzzle Velocity: 1550 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***76% potassium perchlorate, 14.5% epoxy resin, 9.5% aluminum***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used as general propellant for field guns, cannons, and ship guns. Can also be used as a solid rocket propellant.

04-03-006A: Nitro coated high performance gun propellant containing picric acid:
Into a suitable beaker or similar container, place 115 milliliters of 70% nitric acid, followed by 4 liters of refined petroleum liquid, and then allow the acid mixture to stand at room temperature for about 40 minutes Thereafter, add in 115 milliliters of concentrated sulfuric acid, and the blend them mixture for about 2 hours. Thereafter, drown the entire mixture into 4 liters of ice water, and then decant-off the upper organic liquids and place this layer into a clean separate container. Now, Into a suitable mixing bowl or blender, equipped with a motorized stirrer, place 350 milliliters of ether, followed by ***200 grams of barium nitrate***, followed by ***33 grams of wheat flour***, followed by ***33 grams of potassium ferrocyanide***, followed by ***160 grams of picric acid***, followed by ***33 grams of***

potassium chlorate, followed by 40 grams liquid ammonia, followed by ***5 grams of lamp black***, and then blend the mixture on moderate speed until the bulk of the ether evaporates. Thereafter, submerse the propellant grains into the decanted-off organic layer, and then gently blend the mixture for about 10 minutes. Thereafter, filter-off the propellant grains, and then allow them to thoroughly air-dry. Thereafter, the various grain sizes can be separated using various sized sieves. Thereafter, the grains are ready for loading into any desirable shell casing utilizing the normal techniques.

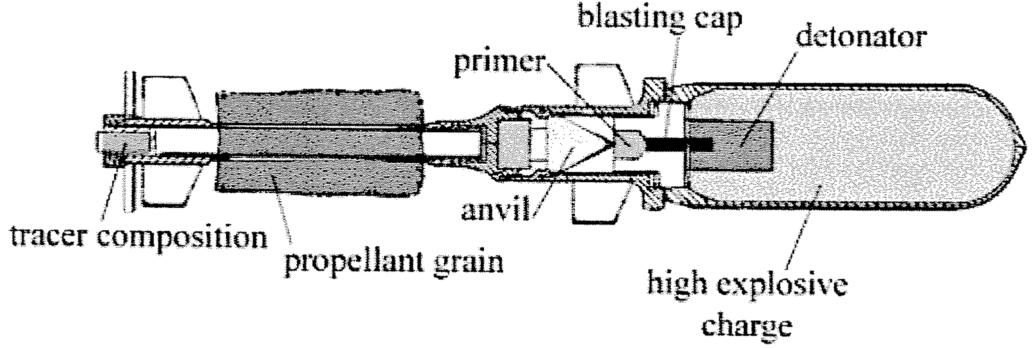
Burn rate: Rapid.
Chamber pressure: 27,000 psi (estimated).
Muzzle Velocity: 1800 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Can be detonated but only under severe conditions.
Percentage: ***43.1% barium nitrate, 34.4% picric acid, 7.1% potassium ferrocyanide, 7.1% wheat flour, 7.1% potassium chlorate, 1% lamp black, 0.20% nitro compounds***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used as general propellant for field guns, cannons, and ship guns.

04-03-007A: High performance sodium azide containing specialty gun propellant:

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place 250 milliliters of hexane, followed by ***334 grams of sodium azide***, followed by ***91 grams of red iron-III-oxide***, and then followed by ***75 grams of black copper oxide***. Thereafter, blend the mixture on moderate speed until about half the solvent has evaporated. When a pasty mass has been formed, place the paste into a typical extruding machine using 1 to 5 millimeter holes, and then extrude the paste through these holes under high pressure to form "spaghetti" like strands of propellant grain ranging up to 12 inches long. Afterwards, evenly cut these strands into lengths of 10 to 20 millimeters in length, and then cure these cyndrical grains at room temperature until they are thoroughly dry. Note: special machines are utilized in commercial process to form an automated and continues process. Now, you can also form grains of various sizes by continuing to blend the mixture until the bulk of the hexane has evaporated leaving behind a pasty material. Now, remember as in previous preparations, the more solvent that evaporates, the smaller the granules will be when blending on high speed. The least amount of solvent that evaporates, after the original formation of the paste or "dough", the larger the granules will be when blending on low speed. Moderate sized granules can be formed by continuing to blend the mixture, after the original formation of the dough, on low speed until the mixture is near dryness. The various grain sizes can be separated using sieves of desired mesh

Burn rate: Rapid.
Chamber pressure: 20,000 psi (estimated).
Muzzle Velocity: 1650 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Possible, but unlikely.
Percentage: ***66.8% sodium azide, 18.2% iron oxide, 15% copper oxide***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in many types of weapons.

Bazooka fired projectile with fin stabilization



04-03-008A: High performance nitrocellulose gun propellant (triple based):

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***273 grams of nitroguanidine***, and then followed by ***200 grams of nitrocellulose***. Thereafter, blend the mixture on moderate speed for about 10 minutes. Thereafter, add in ***90 grams of nitroglycerine***, followed by 20 milliliters of acetone, and then continue to blend the mixture on moderate speed for about 10 minutes. Now, place the mixture into any suitable mixing bowl (Sigma style blade mixer), and then add ***in 274 grams of nitroguanidine***, followed by ***3 grams of finely divided cryolite***, followed by ***45 grams of dibutyl phthalate***, followed by a solvent mixture prepared by adding and dissolving ***15 grams of 2-nitrodiphenylamine*** into 650 milliliters of ethyl alcohol with 350 milliliters of acetone. Thereafter, blend the mixture for 2 hours on moderate speed at 40 Celsius. Thereafter the colloid mixture is ready for pressing. To do so, the mixture simply needs to be transferred to any desired press, blocked, screened, relocked, and then extruded through dies of any desired diameter or dimensions, and then cut to the desired length in the usual manner. The grains should then be cured in an oven or similar device at moderate temperature until dry and hard. The grains can be coated with a very thin layer of graphite if desired.

Burn rate: Rapid.
Chamber pressure: 19,000 psi (estimated).
Muzzle Velocity: 1050 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Possible, but unlikely.
Percentage: ***60.77% nitroguanidine, 22.22% nitrocellulose, 10% nitroglycerine, 5% dibutyl phthalate, 1.66% 2-nitrodiphenylamine, 0.33% cryolite, 0.02% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in howitzers, and for other similar guns.

04-03-008B: High performance nitrocellulose gun propellant (triple based):

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***200 grams of nitrocellulose***, and then add in 2000 milliliters of water and then heat the mixture to 40 Celsius with stirring. Once the nitrocellulose has formed a uniform slurry, add in ***190 grams of nitroglycerine***, followed by ***45 grams of dibutylphthalate***, and then blend the mixture on moderate speed for about 10 minutes. Thereafter, add in a solution by adding ***15 grams of nitrodiphenylamine***, and then continue to blend the mixture for about 10 minutes. Now, heat the mixture to 50 Celsius, and then bubble air through the mixture to drive-off the bulk of the water. Thereafter, add in 600 milliliters of ethyl alcohol, and then followed by 300 milliliters of acetone. Thereafter, add in ***547 grams of nitroguanidine***, and then continue to blend the mixture at 40 Celsius for about 3 hours. Thereafter the colloid mixture is ready for pressing. To do so, the mixture simply needs to be transferred to any desired press, blocked, screened, relocked, and then extruded through dies of any desired diameter or dimensions, and then cut to the desired length in the usual manner. The grains should then be cured in an oven or similar device at moderate temperature until dry and hard. The grains can be coated with a very thin layer of graphite if desired.

Burn rate: Rapid.
Chamber pressure: 27,000 psi (estimated).
Muzzle Velocity: 1900 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Possible, but unlikely.
Percentage: ***54.86% nitroguanidine, 20.06% nitrocellulose, 19.05% nitroglycerine, 4.51% dibutylphthalate, 1.5% nitrogiphenylamine, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in howitzers, and for other similar guns.

04-03-009A: High performance ammonium perchlorate gun propellant:

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***200 grams of nitrocellulose***, and then add in 450 milliliters of linseed oil. Thereafter, blend the mixture for about 15 minutes to form a paste. Thereafter, add in ***25 grams of flours of sulfur***, followed by ***300 grams of ammonium perchlorate***, and then blend the mixture on moderate speed for about 10 minutes. Thereafter, add in ***115 grams of wheat flour***, and then continue to blend the mixture for about 45 minutes. Thereafter the mixture is ready for pressing. To do so, the mixture simply needs to be transferred to any die press, and then extruded through dies of any desired diameter or dimensions to form spaghetti like strands, and then cut the strands into any desired length in the usual manner. The grains should then be cured in an oven or similar device at moderate temperature until dry and hard. The grains can be coated with a very thin layer of graphite if desired.

Burn rate: Rapid.

Chamber pressure: 23,000 psi (estimated).
Muzzle Velocity: 1880 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Possible, but unlikely.
Percentage: ***46.87% ammonium perchlorate, 31.25% nitrocellulose, 17.96% wheat flour, 3.9% flours of sulfur, 0.02% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in multiple firearms.

04-03-009B: High performance perchlorate based gun propellant:
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place ***200 grams of nitrocellulose***, and then add in 450 milliliters of linseed oil. Thereafter, blend the mixture for about 15 minutes to form a paste. Thereafter, add in ***45 grams of flours of sulfur***, followed by ***375 grams of potassium perchlorate***, and then blend the mixture on moderate speed for about 10 minutes. Thereafter, add in ***95 grams of wheat flour***, followed by ***15 grams of sodium azide***, and then continue to blend the mixture for about 45 minutes. Thereafter the mixture is ready for pressing. To do so, the mixture simply needs to be transferred to any die press, and then extruded through dies of any desired diameter or dimensions to form spaghetti like strands, and then cut the strands into any desired length in the usual manner. The grains should then be cured in an oven or similar device at moderate temperature until dry and hard. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 20,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Possible, but unlikely.
Percentage: ***51.36% potassium perchlorate, 27.39% nitrocellulose, 13.01% wheat flour, 6.16% sulfur, 2.05% sodium azide, 0.03% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in multiple firearms.

04-03-009C: High performance chlorate based gun propellant:
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer, place 100 milliliters of vegetable oil, followed by ***300 grams of starch***, and then followed by ***600 grams of potassium chlorate***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture on moderate speed for about 60 minutes. Thereafter the mixture is ready for pressing. To do so, the mixture simply needs to be transferred to any die press, and then extruded through dies of any desired diameter or dimensions to form spaghetti like strands, and then cut the strands into any desired length in the usual manner. The grains should then be cured in an oven or similar device at moderate temperature until dry and hard. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 19,000 psi (estimated).
Muzzle Velocity: 950 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Possible, but unlikely.
Percentage: ***66.66% potassium chlorate, 33.33% starch, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in multiple firearms, but should be limited to cannons.

04-03-010A: High performance nitroguanidine gun propellant:
Into a suitable vertical mixer, or horizontal ball mill, place ***273 grams of nitroguanidine***, followed by ***200 grams of nitrocellulose***, and then followed by ***90 grams of nitroglycerine***. Immediate thereafter, add in 50 milliliters of acetone and then rotate the mixture at 250 RPM for about 30 minuets at room temperature. Thereafter, place this mixture into any suitable mixing drum, container, ect, equipped with motorized stirrer, and then add in ***274 grams of nitroguanidine***, followed by ***30 grams of cryolite***, followed by ***45***

rams of dibutylphthalate, followed by ***15 grams of 2-nitrodiphenylamine***. Thereafter, add in 650 milliliters of ethyl alcohol, and en followed by 350 milliliters of acetone, and then blend the entire mixture on moderate speed until the some of the solvent aporates, and a dough-like material remains. Thereafter, the mixture is ready to extrude. To do so, the dough-like material needs to extruded through any desired die cast machine under high pressure to form spaghetti-like strands of 3 to 5 millimeters in diameter 150 to 300 millimeters in length. Thereafter, the strands should be cut into 4 to 5 millimeters in length, and then resulting grains ould be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if esired.
urn rate: Rapid.
hamber pressure: 20,000 psi (estimated).
uzzle Velocity: 1700 feet per second.
ater resistance: Very good.
ability: Can be stored for many years.
lammability (1 to 10): 9
ase of ignition (1 to 10): 9
endency to cake: None.
xplosive ability: Stable.
ercentage: ***59% nitroguanidine, 21.57% nitrocellulose, 9.7% nitroglycerine, 4.85% dibutylphthalate, 3.23% cryolite, 1.61% 2-itrodiphenylamine, 0.04% mixed balance***
lassification: Deflagrating explosive (classified as propellant).
se: Can be used in ammunition of multiple purposes.

4-03-010B: High performance nitroguanidine gun propellant:
nto a suitable mixing bowl, equipped with motorized stirrer, place ***200 grams of nitrocellulose***, and then followed by 2500 milliliters f water. Thereafter, blend the mixture at 30 Celsius for about 10 minutes to evenly disperse the nitrocellulose. Thereafter, add in ***190 ram of nitroglycerine***, followed by ***45 grams of dibutylphthalate***, and then continue to blend the mixture for about 10 minutes. hereafter, add in ***15 grams of 2-nitrodiphenylamine***, and then once again, continue to blend the mixture for about 10 minuets at 30 elsius. Now, place the mixture into a centrifuge machine, and centrifuged the mixture under high RPM to form the solids to the ottom. Thereafter, pour-off or decant-off the upper water portion as best as possible without pouring-off any solids, and then place he remaining wet solids onto a shallow pan or tray, and allow it to dry for a partial amount of time as to dry the solid content to the oint where water no longer runs-off there from. Now, place these semi-dry solids into a clean mixing drum, equipped with motorized tirrer, and then add in ***547 grams of nitroguanidine***, followed by 250 milliliters of 95% ethyl alcohol and 350 milliliters of acetone. hereafter, blend the mixture for about 45 minutes at 41 Celsius. Thereafter, the mixture is ready for extrusion. To do so, the dough-ike material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strand of 3 to 5 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the strands should be cut into 4 to 5 millimeters in length, and he resulting grains should be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 28,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***54.86% nitroguanidine, 20% nitrocellulose, 19% nitroglycerine, 4.4% dibutylphthalate, 1.5% 2-nitrodiphenylamine, 0.24% mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in ammunition of multiple purposes.

04-03-011A: High performance barium nitrate gun propellant for small arms weapons:
Into a suitable ball mill, or vertical mixer, place ***255 grams of barium nitrate***, followed by ***47.5 grams of powdered soft wood charcoal***, followed by ***37.5 grams of sulfur powder***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and the add in ***85 grams of anhydrous lead nitrate***, followed by ***75 grams of nitrocellulose***, and then followed by 75 milliliters of acetone and 75 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture at 40 to 50 Celsius for about 2 hours. Note: the mixing drum should be closed to prevent evaporation of the solvent. After the mixing period, the mixture is ready for extrusion. To do so, the material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strand of 3 to 5 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the strands should be cut into 1 to 2 millimeters in length, and the resulting grains

should be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 18,000 psi (estimated).
Muzzle Velocity: 1200 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***51% barium nitrate, 17% lead nitrate, 15% nitrocellulose, 9.5% soft wood charcoal, 7.5% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in sporting ammunition, or other various operations.

04-03-011B: High performance barium nitrate gun propellant for small arms weapons:
Into a suitable ball mill, or vertical mixer, place ***260 grams of barium nitrate***, followed by ***55 grams of finely divided graphite***, followed by ***37 grams of sodium hypophosphite***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and the add in ***80 grams of potassium nitrate***, followed by ***90 grams of nitrocellulose***, and then followed by 75 milliliters of acetone and 75 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture at room temperature for about 1 hour. Note: the mixing drum should be closed to prevent evaporation of the solvent. After the mixing period, the mixture is ready for extrusion. To do so, the material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strand of 3 to 5 millimeters in diameter by 150 to 300 millimeters in length. Thereafter, the strands should be cut into 1 to 2 millimeters in length, and the resulting grains should be cured in an oven at moderate temperature in the usual manner. The grains can be coated with a very thin layer of graphite if desired.
Burn rate: Rapid.
Chamber pressure: 18,000 psi (estimated).
Muzzle Velocity: 1250 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***49.8% barium nitrate, 17.24% nitrocellulose, 15.32% potassium nitrate, 10.53% graphite, 7.08% sodium hypophosphite, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in sporting ammunition, or other various operations.

04-03-012A: Specialty high performance ammonium picrate gun propellant:
Into a suitable ball mill, or vertical mixer, place ***235 grams of ammonium picrate***, followed by ***115 grams of potassium dichromate***, and then followed by ***150 grams of barium nitrate***. Thereafter, tumble or rotate the mixture at 75 RPM for about 2 hours at room temperature. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 90 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture at room temperature for about 1 hour. After the mixing period, the mixture is ready for extrusion. To do so, the material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strands in the usual manner. Thereafter, the strands should be cut into 1 to 2 millimeters in length, and the resulting grains should be cured in an oven at moderate temperature in the usual manner. The mixture can be granulated using any desire means if desired. Note: do not coat the grains with graphite.
Burn rate: Rapid.
Chamber pressure: 34,000 psi (estimated).
Muzzle Velocity: 1950 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Capable of detonating.
Percentage: ***47% ammonium picrate, 30% barium nitrate, 23% potassium dichromate***
Classification: Deflagrating explosive (classified as explosive).

Use: Can be used in Naval guns, or other high caliber guns. Should not be used in small arms weapons.

04-03-013A: High performance ammonium picrate gun propellant:
Into a suitable ball mill, or vertical mixer, filled with 500 grams of Teflon coated steel shot, place ***125 grams of ammonium picrate***, and then followed by ***260 grams of potassium nitrate***. Thereafter, tumble or rotate the mixture at 175 RPM for about 2 hours at room temperature. Thereafter, add in ***50 grams of flours of sulfur***, followed by ***15 grams of soft wood charcoal***, and then followed by ***50 grams of cornstarch***. Thereafter, continue to tumble the mixture for about 1 hour. Thereafter, place this tumbled mixture into a clean mixing bowl, equipped with motorized stirrer, and then add in 100 milliliters of ether, and then blend the mixture for about 15 minutes. After the mixing period, the mixture is ready for extrusion. To do so, the material needs to be extruded through any desired die cast machine under high pressure to form spaghetti-like strands in the usual manner. Thereafter, the strands should be cut into 1 to 2 millimeters in length, and then resulting grains should be cured in an oven at moderate temperature in the usual manner. The mixture can be granulated using any desired means if desired.
Burn rate: Rapid.
Chamber pressure: 21,000 psi (estimated).
Muzzle Velocity: 1400 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Capable of detonating.
Percentage: ***52% potassium nitrate, 25% ammonium picrate, 10% sulfur, 10% corn starch, 3% soft wood charcoal***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in small arms, but more specifically in shotguns.

04-03-014A: High performance barium nitrate gun propellant:
Into a clean mixing bowl, equipped with motorized stirrer, place ***60 grams of nitro-naphthalene***, followed by ***400 grams of pyroxyline***, followed by ***400 grams of barium nitrate***, and the followed by ***50 grams of potassium nitrate***. Thereafter, add in 250 milliliters of 95% ethyl alcohol, followed by 75 milliliters of warm water, and then blend the mixture on moderate speed for about 1 hour to form a uniform mass. Thereafter, place the mixture into a suitable press machine, and then press out the water and other liquids. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be extruded using any die cast machine, or granulated in any desired method to form various grain sizes that can be separated using the usual methods.
Burn rate: Rapid.
Chamber pressure: 19,000 psi (estimated).
Muzzle Velocity: 1050 feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on chamber combustion).
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***43.95% barium nitrate, 43.95% pyroxyline, 6.59% nitro-naphthalene, 5.49% potassium nitrate, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in small arms.

04-03-014B: High performance barium nitrate gun propellant (sulfur induced):
Into a clean mixing bowl, equipped with motorized stirrer, place ***100 grams of nitro-naphthalene***, followed by ***3000 grams of pyroxyline***, followed by ***1200 grams of barium nitrate***, followed by ***500 grams of potassium nitrate***, and then followed by ***100 grams of sulfur***. Thereafter, add in 500 milliliters of 95% ethyl alcohol, followed by 200 milliliters of cold water, and then blend the mixture on moderate speed for about 90 minutes to form a uniform mass. Thereafter, place the mixture into a suitable press machine, and then press out the water and other liquids. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be extruded using any die cast machine, or granulated in any desired method to form various grain sizes that can be separated using the usual methods.
Burn rate: Moderate.
Chamber pressure: N/A
Muzzle Velocity: N/A
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on chamber combustion).
Ease of ignition (1 to 10): 9
Tendency to cake: None.

Explosive ability: Stable.
Percentage: *61.22% pyroxyline, 24.48% barium nitrate, 10.2% potassium nitrate, 2.04% nitro-naphthalene, 2.04% sulfur, 0.02% mixed balance*
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in small arms, more specifically for use in riffles. Note: the addition of the sulfur permits the mixture to be used as a blasting agent for soft rock.

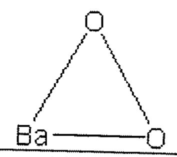
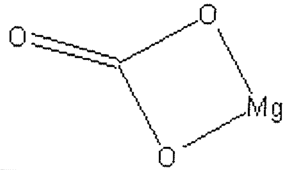
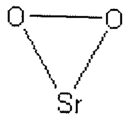
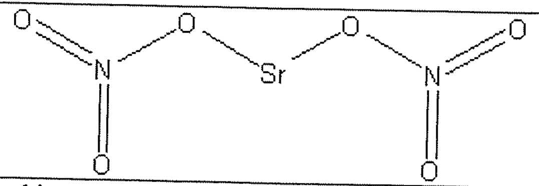
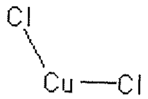
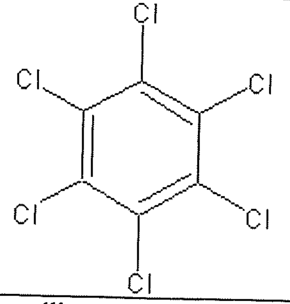
04-03-015A: High performance "smokeless powder" ammonium picrate gun propellant:
Into a clean beaker, add and dissolve ***35 grams of potassium permanganate*** into 125 milliliters of hot water. Thereafter, into a separate beaker, place 525 milliliters of water, and then add and dissolve ***125 grams of potassium dichromate***. Now, pour the hot potassium permanganate solution into the potassium dichromate solution, and then allow the combined solutions to cool to room temperature. Once it has, add in ***340 grams of ammonium picrate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, add in 500 milliliters of acetone, and then continue to blend the mixture for about 30 minutes. Thereafter, filter-off the insoluble mass, and then vacuum dry or air-dry it. Note: the acetone can be recycled if desired using any desired method. Once the filtered-off mass has dried, it can be pulverized manually, and then resulting grain sizes separated using sieves in the usual manner. If desired, the dried mass can be moistened with alcohol, and then extruded using any die cast machine, or granulated in any desired method to form various grain sizes that can be separated using the usual methods.
Burn rate: Rapid.
Chamber pressure: 38,000 psi (estimated).
Muzzle Velocity: 2000+ feet per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *68% ammonium picrate, 25% potassium dichromate, 7% potassium permanganate*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used as a gun propellant for high performance firearms.

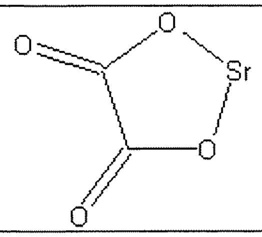
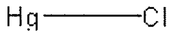
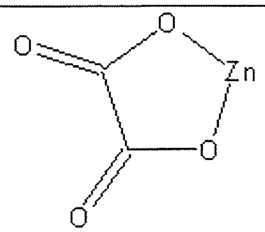
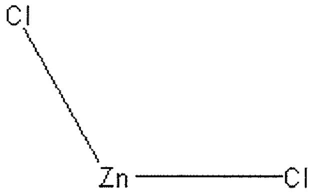
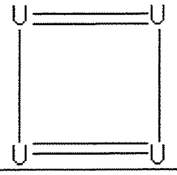
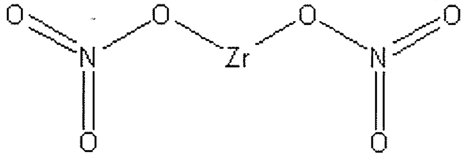
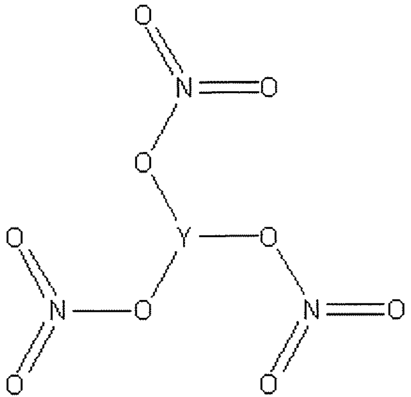
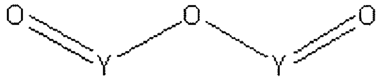
5. General non-propellant pyrotechnic compositions

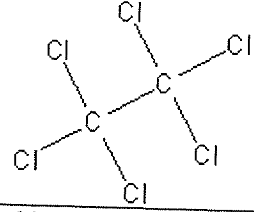
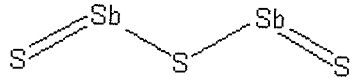
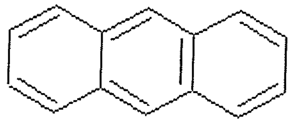
Section 1: Bullet Tracer compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**

59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide	**84. Magnesium Carbonate**
	
Forms a grayish-white to white powder. The powder is insoluble in water, but is capable of forming an octahydrate. The salt slowly decomposes in moist air, or in contact with water. Barium peroxide decomposes rapidly in the presence of acid.	Forms a white odorless solid, granules, or powder. The commercial grade contains a carbonate hydroxide. The solid breaks down rapidly in the presence of acids. The carbonate is insoluble in water and all organic solvents.
85. Strontium Peroxide	**86. Strontium Nitrate**
	
Strontium peroxide forms a white odorless powder. The powder is insoluble in water, but slowly reacts with it forming oxygen. The salt decomposes in the presence of acids. The solid should be stored in airtight bottles away from moist air.	Forms white granules or powder. The powder has a melting point of 570 Celsius. The nitrate is soluble in water, and slowly forms a tetrahdyrate there with.
87. Cupric chloride	**88. Hexachlorobenzene**
	
Forms a yellowish to yellowish-brown crystalline solid, which readily forms hydrates with water. The salt slowly decomposes when heated above 300 Celsius, but melts at 498 Celsius. The solid is readily soluble in water, alcohol, and	Forms colorless crystalline needles with a melting point of 231 Celsius. The crystals are sublimable and may be volatile with steam. The crystals are insoluble in water and alcohol, but soluble in common solvents.

acetone. Can be prepared by reacting dry chlorine with copper scrap, or via electrochemical methods.	
89. Strontium oxalate	**90. Mercury-I-Chloride**
	
Forms a monohydrate, which forms colorless to white crystals, granules, or powder. The crystals are insoluble in water and the usual solvents, but are capable of dissolving in glacial acetic acid.	Forms a white heavy powder, which slowly decomposes in air. The salt cannot be melted, as the crystals sublime when heated to 400 Celsius. Mercury chloride is insoluble in water and most organic solvents. A strong reducing agent. Keep bottles well closed and avoid skin contact.
91. Zinc Oxalate	**92. Zinc Chloride**
	
Forms a dihydrate. Slightly soluble in water and the usual solvents. Soluble in acids.	Forms colorless to white crystals, granules, or powder. The crystals are extremely hygroscopic and can absorb moisture from the air until a self-solution is produced. Readily soluble in alcohol and the usual solvents. Zinc chloride has a melting point of 290 Celsius. The crystals are also freely soluble in acetone. Can be made by reacting zinc metal with hydrochloric acid, or by neutralizing zinc hydroxide, oxide, or carbonate with hydrochloric acid.
93. Uranium	**94. Zirconium nitrate**
	
Uranium forms a silvery-white to grayish to dark gray radioactive metal. Uranium is stable at room temperature, but rapidly tarnishes forming an oxide layer. Powdered Uranium is spontaneously combustible. Users should use caution.	Forms a pentahydrate, which forms white to colorless crystals, granules, or powder. The crystals are very soluble in water and alcohol.
95. Yttrium Nitrate	**96. Yttrium Oxide**
	
Forms a hexahydrate, which forms deliquescent colorless crystals, or white granules, or powder. The powder is somewhat unstable and begin to breaks down at room	Yttrium oxide is a white powder or lumps. The powder is stable at ordinary temperatures. The powder has a strong tendency for ammonia, and will displace ammonia from

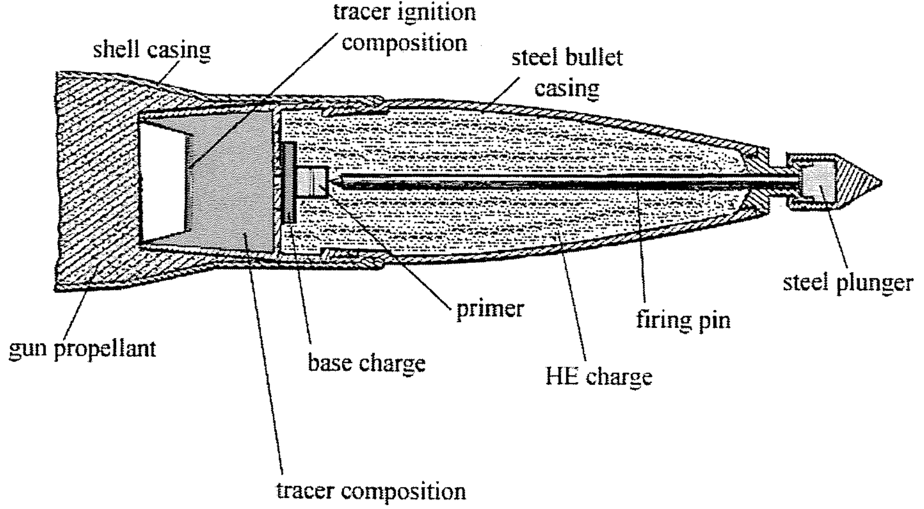
temperature upon standing in moist air. Decomposes when heated.	ammonium salts. Can be prepared by roasting yttrium salts.
97. Zirconium Oxide	**98. Cerium Oxide**
$O=Zr=O$	$O=Ce=O$
Forms a white powder or granular masses. Zirconium oxide is insoluble in water and the usual solvents, but soluble in acids.	Ceric oxide forms a heavy white powder, which is often colored yellow due to impurities. The oxide is insoluble in water and the usual solvents. Some forms of the oxide are resistant to acids.
99. Hexachloroethane	**100. Antimony trisulfide**
	
Forms colorless to white crystals, granules, or powder that have a distinct camphor like odor. The crystals are insoluble in water, but soluble in most common solvents.	Forms a grayish powder or grayish-black crystalline powder. The powder has a melting point of 550 Celsius. Antimony trisulfide is insoluble in water and all solvents, and reacts with acids forming hydrogen sulfide. Antimony trisulfide is stable, but may ignite upon strong friction or percussion.
101. Anthracene	
	
Anthracene forms monoclinic plates, which are colorless when pure, but usually colored yellow with green fluorescence. Anthracene is insoluble in all known solvents. Often a constituent of smoke produced by burning wood.	

- Bullet Tracer Compositions in this section -

1. 05-01-001A: Infrared Tracer composition for shells: *32.87% strontium peroxide, 32.87% barium peroxide, 10.95% magnesium carbonate, 10.95% calcium resinate, 10.95% barium nitrate, 1.36% silicon powder, 0.05% impurities*	**2. 05-01-002A: "Invisible" tracer composition visible only by shooters wearing or using night vision goggles, infrared viewers, or thermal imaging devices:** *37.5% strontium peroxide, 37.5% barium peroxide, 15% magnesium carbonate, 10% calcium resinate*
3. 05-01-003A: High performance tracer composition 1: *46.4% strontium nitrate, 42.5% magnesium, 5% magnesium carbonate, 4% Kynar binder, 2% PVC, 0.10% moisture*	**4. 05-01-004A: High performance white tracer composition with reduced base drag**: *54% magnesium, 30% Teflon binder, 16% Viton A binder*
5. 05-01-005A: High performance pinkish-red tracer composition with reduced base drag: *45% magnesium, 23% Teflon binder, 17% strontium nitrate, 15% Viton A binder*	**6. 05-01-005B: High performance red tracer composition with reduced base drag:** *45% magnesium, 20% Teflon binder, 20% strontium nitrate, 12% Viton A binder, 3% carbon black*
7. 05-01-006A: Blue tracer composition with gray smoke trail: *38.5% barium nitrate, 15.4% anhydrous cupric chloride, 15.4% potassium perchlorate, 15.3% hexachlorobenzene, 7.7% sulfur, 7.7% magnesium*	**8. 05-01-007A: High visibility tracer composition:** *49.5% strontium nitrate, 16.8% magnesium, 13.8% calcium resinate, 5.9% aluminum, 4.9% strontium oxalate, 4.9% mercurous chloride, 3.9% sodium nitrate, 0.30% residue*
9. 05-01-007B: High visibility tracer composition (modified): *49.5% strontium nitrate, 16.8% magnesium, 13.8% calcium resinate, 5.9% aluminum, 4.9% zinc oxalate, 4.9% zinc chloride, 3.9% sodium nitrate, 0.30% residue*	**10. 05-01-007C: High visibility tracer composition with reduced illumination for anti-aircraft guns:** *78% strontium peroxide, 7% calcium resinate, 7% calcium silicide, 4% lead dioxide, 4% barium peroxide*
11. 05-01-008A: Long burning tracer composition containing depleted uranium for use in long range weapons such as sniper riffles, heavy machine guns, mortars, and artillery shells: *73.2% depleted uranium, 12.2% aluminum/magnesium alloy, 12.2% potassium perchlorate, 2.3% epoxy resin, 0.10% residue*	**12. 05-01-009A: High intensity illuminous tracer composition for use in riffles, heavy machine guns, and flares:** *30% yttrium nitrate, 20% magnesium, 20% barium peroxide, 10% zirconium nitrate, 10% calcium resinate, 10% lead sulpho-cyanate*
13. 05-01-009B: High intensity illuminous tracer composition for use in sniper riffles, heavy machine guns, and flares (modified): *28.8% sodium nitrate, 24% strontium nitrate, 19.2% calcium resinate, 19.2% magnesium, 4.8% yttrium oxide, 3.8% zirconium oxide, 0.20% residue*	**14. 05-01-010A: High intensity illuminous tracer composition for use in riffles, heavy machine guns, rockets, grenade projectiles, and similar projectiles:** *36.1% strontium nitrate, 24% magnesium, 24% cerium nitrate, 15% calcium resinate, 0.66% thorium nitrate, 0.24% impurities*
15. 05-01-010B: High intensity illuminous tracer composition for use in riffles, heavy machine guns, rockets, grenade projectiles, and similar projectiles (modified): *31.5% sodium nitrate, 26.3% strontium nitrate, 21% magnesium, 10.5% calcium oxide, 5.2% cerium oxide, 5.2% thorium oxide. 0.30% residue*	**16. 05-01-011A: Tracer composition for use in high velocity projectiles fired by tanks, guns, and other firing weapons whereby the firer/soldier is utilizing laser optic sighting devices:** *40% magnesium, 20% strontium nitrate, 15% potassium nitrate, 9% iron-III-oxide, 5% sodium nitrate, 5% manganese dioxide, 5% Viton A binder, 1% ethyl cellulose*
17. 05-01-011B: Tracer composition for use in high velocity projectiles fired by tanks, guns, and other firing weapons whereby the firer/soldier is utilizing laser optic sighting devices (modified): *40% magnesium, 20% strontium nitrate, 15% potassium perchlorate, 10% barium peroxide, 5% sodium nitrate, 5% polyvinyl chloride, 5% Viton A binder*	**18. 05-01-012A: Tracer composition with increased red luminosity:** *33.2% strontium nitrate, 33.2% magnesium, 23.9% strontium tartrate, 4.3% hexachlorobenzene, 4.3% stearic acid, 0.78% wood charcoal, 0.32% combined impurities*
19. 05-01-013A: Green tracer composition with increased luminosity: *41.1% barium nitrate, 29.4% hexachloroethane, 27.4% magnesium, 1.9% linseed oil, 0.2% impurities*	**20. 05-01-013B: Red tracer composition with increased luminosity:** *40% strontium nitrate, 33% magnesium, 25% hexachloroethane, 2% linseed oil*
21. 05-01-013C: Bluish-green tracer composition with high luminosity: *42% barium nitrate, 40% hexachloroethane, 17% magnesium, 1% copper*	**22. 05-01-014A: Tracer composition with reduced base drag:** *70.9% strontium peroxide, 10% gelatin, 8.2% calcium resinate, 7.3% magnesium, 3.6% carbon black*
23. 05-01-014B: Tracer composition with reduced base drag and increased burn range: *49.3% strontium nitrate, 25.4% magnesium, 15.3% PVC, 10% gelatin*	**24. 05-01-015A: White light tracer composition:** *57.14% magnesium powder, 38.09% sodium nitrate, 4.76% binder, 0.01% residual balance*
25. 05-01-016A: White light tracer composition with sparkling effect: *33.44% aluminum powder, 33.44% sodium chlorate, 16.72% coarse magnesium grains, 6.02% zinc oxide, 5.35% binder, 5.01% potassium dichromate, 0.02% residual balance*	**26. 05-01-017A: Specialty depleted uranium tracer composition for large caliber ammunition:** *50% depleted uranium metal, 25% aluminum magnesium alloy, 25% potassium perchlorate*
27. 05-01-018A: Multi purpose tracer composition for various applications: *76% barium peroxide, 20% magnesium*	**28. 05-01-018B: Multi purpose tracer composition for various applications:** *73.5% barium peroxide, 24% magnesium*

powder, 4% aluminum stearate	*powder, 2.5% magnesium stearate*
29. 05-01-018C: Multi purpose tracer composition for various applications: *73.07% barium peroxide, 19.23% magnesium powder, 7.69% zinc stearate, 0.01% residual balance*	**30. 05-01-019A: Tracer composition for high caliber projectiles:** *60% barium peroxide, 35% antimony trisulfide, 4% asphaltum, 1% graphite powder*
31. 05-01-020A: Specialty red tracer composition with red smoke trail for use in daytime operations: *70% strontium peroxide, 15% 1-methylaminoanthraquinone dye agent, 10% calcium resinate, 5% magnesium powder*	**32. 05-01-020B: Specialty tracer composition with red smoke trail for use in daytime operations only:** *70% strontium peroxide, 10% 1-methylaminoanthraquinone dye agent, 10% calcium resinate, 10% magnesium powder*
33. 05-01-020C: Specialty tracer composition with yellow smoke trail for use in daytime operations only: *80% strontium peroxide, 10% auramine dye, 10% calcium resinate*	**34. 05-01-020D: Specialty tracer composition with black smoke trail for use in daytime operations:** *70% strontium peroxide, 15% anthracene, 10% calcium resinate, 5% magnesium powder*

05-01-001A: Infrared Tracer composition for shells:
Into a standard ball mill, add ***144 grams of strontium peroxide***, followed by ***144 grams of barium peroxide***, ***48 grams of barium nitrate***, followed by ***48 grams of magnesium carbonate***, followed by ***48 grams of calcium resinate***, and finally followed by ***6 grams of finely ground elemental (powdered) silicon***. Immediately thereafter, add in 150 milliliters of benzene, toluene, or xylene, and then add in 100 grams of Teflon coated steel shot of 5 millimeters in diameter, and then rotate the mixture at 190 RPM for 2 hours. After 2 hours, remove the mixture from the ball mill, and then separate the solvent from the rest of the mixture by using filtration to recover the insoluble tracer mixture. You can use regular filtration (gravity), but vacuum filtration works best. Either way, after you have collected the tracer mixture, place it onto a shallow pan, and allow it to thoroughly air-dry for 1 week or more. Thereafter, place the dried mass into a clean ball mill, and ball mill using clean steel shot for about 2 hours at room temperature to form a uniform finely divided mixture. Once the mixture has been thoroughly blended, it is ready for use. To use the tracer mixture, it must be pressed into the back of the desired projectile (a tracer compartment) under high pressure (80,000 psi) using a hydraulic press.
Burn rate: about 2.08 seconds per 1.375 grams
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***32.87% strontium peroxide, 32.87% barium peroxide, 10.95% magnesium carbonate, 10.95% calcium resinate, 10.95% barium nitrate, 1.36% silicon powder, 0.05% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military ammunition for 20 to 120 millimeter gun/cannon shells, or higher.

<table>
<tr><th>Exploding .50 caliber projectile w/tracer</th><th>Details</th></tr>
<tr><td>
</td><td>In this illustration, a .50 caliber projectile with exploding tip and tracer is shown. The projectile operates using compression, where by the nose of the projectile impacts the target, and the firing pin is compressed inwards, whereby it strikes a primer. The primer sets-off the base charge, which then detonates the HE charge.</td></tr>
</table>

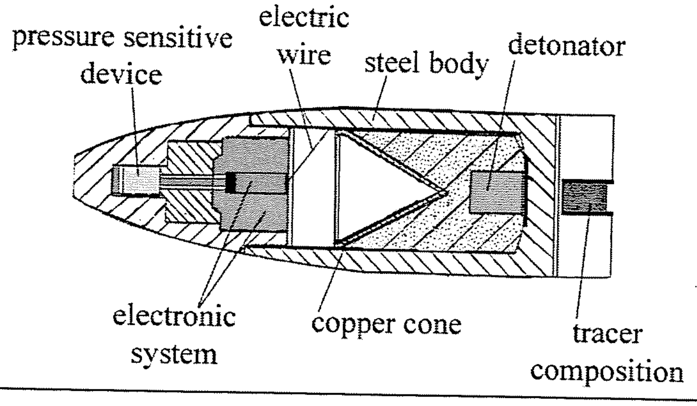
05-01-002A: "Invisible" tracer composition visible only by shooters wearing or using night vision goggles, infrared viewers, or thermal imaging devices:
Into a standard ball mill, add ***150 grams of strontium peroxide***, followed by ***150 grams of barium peroxide***, followed by ***60 grams of magnesium carbonate***, and then followed by ***40 grams of calcium resinate***. Immediately thereafter, add in 50 milliliters of benzene, toluene, or xylene, and then add in 100 grams of Teflon coated steel shot of 5 millimeters in diameter, and then rotate the mixture at 200 RPM for 2 hours. After 2 hours, remove the mixture from the ball mill, and then place the mixture onto a shallow pan and allow it thoroughly dry for up to a week or more. When the odor of solvent is gone, place the dried mass into a clean ball mill filled with clean Teflon coated stainless steel shot, and tumble it at 200 RPM for about 1 hour to form a uniform finely divided mixture. Once the mixture has been thoroughly blended, to use the tracer mixture, it must be pressed into the back of the desired bullet or projectile (a tracer compartment) under high pressure (100,000 psi) using a hydraulic press or equivalent.
Burn rate: Slow burning.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***37.5% strontium peroxide, 37.5% barium peroxide, 15% magnesium carbonate, 10% calcium resinate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military ammunition for riffles, machine guns, and projectiles up to 20 millimeters.

05-01-003A: High performance tracer composition 1:
Into a suitable beaker place 380 milliliters of acetone, and then add and dissolve ***20 grams of Kynar 9301 trademark*** (from Penwalt Co.) (terpolymer of vinylidene fluoride, hexafluoropropylene and polytetrafluoroethylene). Then into a standard ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***25 grams of magnesium carbonate***, followed by ***10 grams of powdered PVC***, followed by ***232 grams of strontium nitrate***. Thereafter, tumble the mixture at 200 RPM at room temperature for about 1 hour. During this 1-hour mixing period, go ahead and add ***212.5 grams of magnesium powder*** to the beaker containing the Kynar 9301 or Viton A/acetone solution and then rapidly blend the mixture for about 30 minutes at room temperature. Now, after 30 minutes, add to the beaker, 380 milliliters of hexane and then rapidly blend them mixture for about 5 minutes. Immediately after 5 minutes, add in the dry mixture from the ball mill operation, and then rapidly blend the entire new mixture for 1 hour using a motorized stirrer. After 1 hour, filter-off the insoluble mass, and then vacuum dry or air-dry it using the normal techniques. Note: if using vacuum drying, it does not have to be fully dried, and should be kept slightly wet. After the filtration process, place the wet mass onto a shallow tray, and then place the tray into an oven and heat at 50 Celsius for until the mixture is completely dry. Thereafter, place the dried mass into a clean ball mill filled with 100 grams or so of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 150 RPM for 1 hour to form a uniform mixture. Thereafter, press the mixture into your tracer compartments on the back-side of each projectile under high pressure of about 80,000 psi.
Burn rate: 3.8 millimeters per second
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.4% strontium nitrate, 42.5% magnesium, 5% magnesium carbonate, 4% Kynar binder, 2% PVC, 0.10% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military ammunition for machine guns, and projectiles up to 120 millimeters.

05-01-004A: High performance white tracer composition with reduced base drag:
Into a suitable beaker or container, place 500 milliliters of acetone, and then add and dissolve ***80 grams of Viton A*** (fluorine-containing copolymer). Thereafter, add in ***150 grams of Teflon No. 7***, and then rapidly blend the mixture for about 30 minutes using preferably a motorized stirrer. After 30 minutes, add in ***270 grams of magnesium powder***, and then continue to blend the mixture for about 30 minutes. After 30 minutes, add to the beaker, 500 milliliters of hexane and then rapidly blend the entire mixture for 1 hour. After 1 hour, filter-off the insoluble mass, and then vacuum dry or air-dry it using the normal techniques. Note: if using vacuum drying, it does not have to be fully dried, and should be kept slightly wet. After the filtration process, place the wet mass onto a shallow tray, and then let it stand at room temperature for several days until the odor of solvent if gone. Once the odor of solvent is gone, place the dried mass into a clean ball mill filled with 100 grams or so of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 165 RPM for 30 minutes to form a uniform mixture. Thereafter, press the mixture into your tracer compartments on the backside of each projectile under high pressure of about 20,000 psi. Note: a small amount of a standard pyrotechnic igniter composition should then be pressed into the tracer cavity after the initial tracer composition to ensure proper ignition after firing the shell.
Burn rate: Slow
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7

Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: *54% magnesium, 30% Teflon binder, 16% Viton A binder*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military ammunition for machine guns, and projectiles up to 120 millimeters.

Tank fired Anti-tank projectile w/tracer

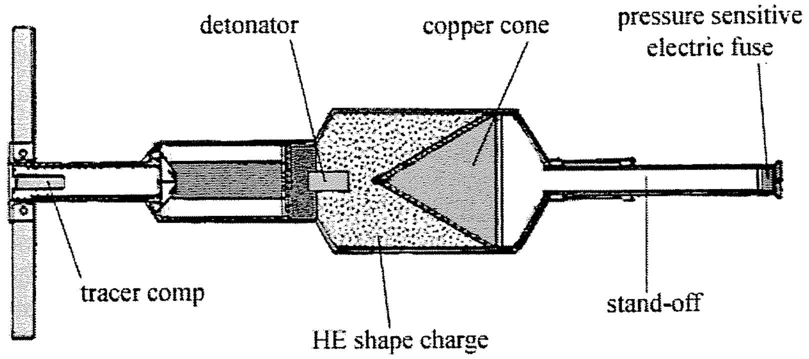


05-01-005A: High performance pinkish-red tracer composition with reduced base drag:
Into a suitable beaker or container, place 500 milliliters of acetone, and then add and dissolve *75 grams of Viton A* (fluorine-containing copolymer). Thereafter, add in *115 grams of Teflon No. 7,* and then rapidly blend the mixture for about 30 minutes using preferably a motorized stirrer. After 30 minutes, add in *225 grams of magnesium powder*, followed by *85 grams of strontium nitrate,* and then continue to blend the mixture for about 30 minutes. Now, after 30 minutes, add to the beaker, 500 milliliters of hexane and then rapidly blend the entire mixture for 30 minutes. After about 30 minutes, filter-off the insoluble mass, and then vacuum dry or air-dry it using the normal techniques. Note: if using vacuum drying, it does not have to be fully dried, and should be kept slightly wet. After the filtration process, place the wet mass onto a shallow tray, and then let it stand at room temperature for several days until the odor of solvent if gone. Once the odor of solvent is gone, place the dried mass into a clean ball mill filled with 100 grams or so of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 165 RPM for 30 minutes to form a uniform mixture. Thereafter, press the mixture into your tracer compartments on the backside of each projectile under high pressure of about 40,000 psi. Note: a small amount of a standard pyrotechnic igniter composition should then be pressed into the tracer cavity after the initial tracer composition to ensure proper ignition after firing the shell.
Burn rate: 10 seconds when using a tracer cavity of 0.70 inches
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *45% magnesium, 23% Teflon binder, 17% strontium nitrate, 15% Viton A binder*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military ammunition for 25 and 75-millimeter projectiles.

05-01-005B: High performance red tracer composition with reduced base drag:
Into a suitable beaker or container, place 500 milliliters of acetone, and then add and dissolve *60 grams of Viton A* (fluorine-containing copolymer). Thereafter, add in *100 grams of Teflon No. 7,* and then rapidly blend the mixture for about 15 minutes using preferably a motorized stirrer. After 15 minutes, add in *225 grams of magnesium powder*, followed by *followed by 100 grams of strontium nitrate,* followed by *15 grams of carbon black,* and then continue to blend the mixture for about 15 minutes. Now, after 15 minutes, add to the beaker, 500 milliliters of hexane and then rapidly blend the entire mixture for 30 minutes. After 30 minutes, filter-off the insoluble mass, and then vacuum dry or air-dry it using the normal techniques. Note: if using vacuum drying, it does not have to be fully dried, and should be kept slightly wet. After the filtration process, place the wet mass onto a shallow tray, and then let it stand at room temperature for several days until the odor of solvent if gone. Once the odor of solvent is gone, place the dried mass into a clean ball mill filled with 100 grams or so of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 165 RPM for 1 hour to form a uniform mixture. Thereafter, press the mixture into your tracer compartments on the backside of each projectile under high pressure of about 40,000 psi. Note: a small amount of a standard pyrotechnic igniter composition should then be pressed into the tracer cavity after the initial tracer composition to ensure proper ignition after firing the shell.
Burn rate: similar to 05-01-005A

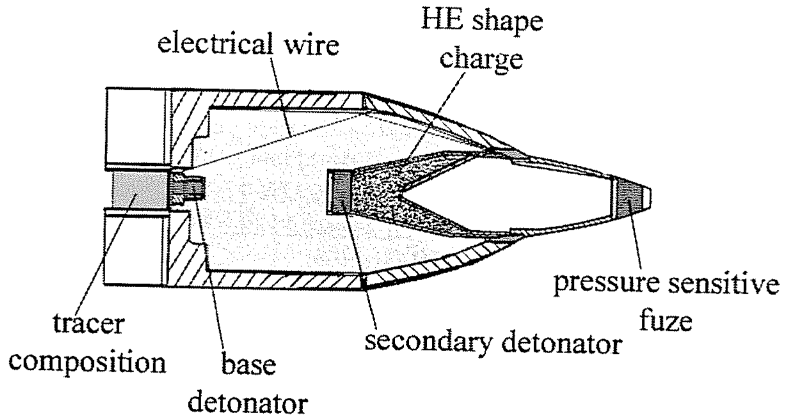
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: *45% magnesium, 20% Teflon binder, 20% strontium nitrate, 12% Viton A binder, 3% carbon black*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military ammunition for 25 to 90 millimeter projectiles.

Classic Tank-fired anti-tank projectile (HEAT)



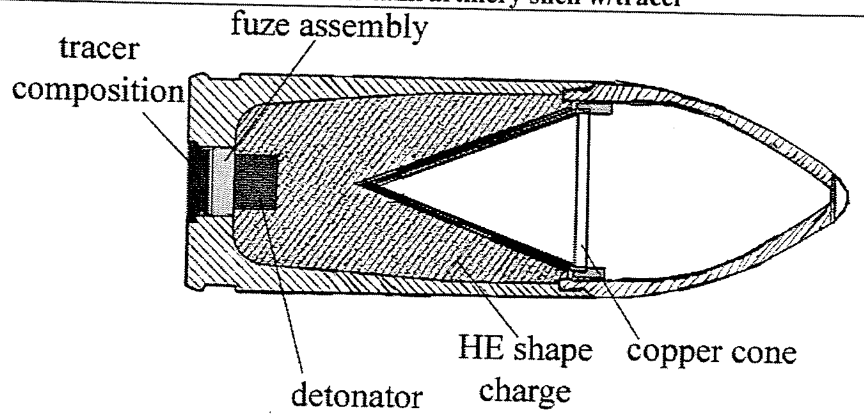
05-01-006A: Blue tracer composition with gray smoke trail:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place *76.5 grams of hexachlorobenzene*, followed by *77 grams of anhydrous cupric chloride,* followed by *38.5 grams of sulfur powder,* and then followed by 50 milliliters of hexane, and then tumble the mixture at 300 RPM for 2 hours. Thereafter, throw in *192.5 grams of barium nitrate,* followed by *38.5 grams of potassium perchlorate,* and then continue to tumble the mixture for about 1 hour at 300 RPM. Afterwards, add in *77 grams of magnesium* powder, and then continue tumbling the mixture at 300 RPM for 1 hour. After 1 hour, remove the mixture from the ball mill, and then place the mixture onto a shallow pan and allow it air-dry until the odor of solvent is gone. Thereafter, place the mixture into a clean ball mill, and tumble the mixture with 100 grams of Teflon coated steel shot of 5 millimeters in diameter at 150 RPM for 2 hours to form a uniform mixture. Thereafter, the mixture is ready to go. To use, press the mixture into your tracer compartments on the backside of each projectile under high pressure of about 40,000 psi. Note: a small amount of a standard pyrotechnic igniter composition should then be pressed into the tracer cavity after the initial tracer composition to ensure proper ignition after firing the shell.
Burn rate: Average
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *38.5% barium nitrate, 15.4% anhydrous cupric chloride, 15.4% potassium perchlorate, 15.3% hexachlorobenzene, 7.7% sulfur, 7.7% magnesium*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military ammunition of any desired caliber.

Tandem "binary" HE shape charge for anti-ship means



05-01-007A: High visibility tracer composition:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***140 grams of calcium resinate,*** followed by ***60 grams of standard powdered aluminum,*** followed by ***170 grams of standard powdered magnesium,*** followed by ***50 grams of strontium oxalate,*** and then followed by 50 milliliters of 95% ethyl alcohol, or 50 milliliters of denatured alcohol, and then tumble the mixture at 150 RPM for 1 hour. Thereafter, throw in ***500 grams of strontium nitrate,*** followed by ***40 grams of sodium nitrate,*** and then continue to tumble the mixture for about 1 hour at 150 RPM. Afterwards, add in ***50 grams of mercurous chloride,*** and then continue tumbling the mixture at 150 RPM for 1 hour. After 1 hour, remove the mixture from the ball mill, and then place the mixture onto a shallow pan and allow it air-dry until the odor of solvent is gone. Thereafter, place the mixture into a clean ball mill, and tumble the mixture with 100 grams of Teflon coated steel shot of 5 millimeters in diameter at 150 RPM for 1 hour to form a uniform mixture. Thereafter, the mixture is ready to go. To use, press the mixture into your tracer compartments on the backside of each projectile under high pressure of about 40,000 psi. Note: a small amount of a standard pyrotechnic igniter composition should then be pressed into the tracer cavity after the initial tracer composition to ensure proper ignition after firing the shell.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *49.5% strontium nitrate, 16.8% magnesium, 13.8% calcium resinate, 5.9% aluminum, 4.9% strontium oxalate, 4.9% mercurous chloride, 3.9% sodium nitrate, 0.30% residue*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military ammunition of any desired caliber—not recommended for machine guns due to it's luminosity and potential for giving firers positions away.

Direct fire anti-tank artillery shell w/tracer



05-01-007B: High visibility tracer composition (modified):
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***140 grams of calcium resinate,*** followed by ***60 grams of standard powdered aluminum,*** followed by ***170 grams of standard powdered magnesium,*** followed by ***50 grams of zinc oxalate,*** and then followed by 50 milliliters of 95% ethyl alcohol, or 50 milliliters of denatured alcohol, and then tumble the mixture at 150 RPM for 1 hour. Thereafter, throw in ***500 grams of strontium nitrate,*** followed by ***40 grams of sodium nitrate,*** and then continue to tumble the mixture for about 1 hour at 150 RPM. Afterwards, add in ***50 grams of zinc chloride,*** and then continue tumbling the mixture at 150 RPM for 1 hour. After 1 hour, remove the mixture from the ball mill, and then place the mixture onto a shallow pan and allow it air-dry until the odor of solvent is gone. Thereafter, place the mixture into a clean ball mill, and tumble the mixture with 100 grams of Teflon coated steel shot of 5 millimeters in diameter at 150 RPM for 1 hour to form a uniform mixture. Thereafter, the mixture is ready to go. To use, press the mixture into your tracer compartments on the backside of each projectile under high pressure of about 40,000 psi. Note: a small amount of a standard pyrotechnic igniter composition should then be pressed into the tracer cavity after the initial tracer composition to ensure proper ignition after firing the shell.

Burn rate: Average
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *49.5% strontium nitrate, 16.8% magnesium, 13.8% calcium resinate, 5.9% aluminum, 4.9% zinc oxalate, 4.9% zinc chloride, 3.9% sodium nitrate, 0.30% residue*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military ammunition of any desired caliber—not recommended for machine guns due to it's luminosity and potential for giving firers positions away.

05-01-007C: High visibility tracer composition with reduced illumination for anti-aircraft guns:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***35 grams of calcium resinate,*** followed by ***35 grams of calcium silicide,*** and then followed by 50 milliliters of 95% ethyl alcohol, or 50 milliliters of denatured alcohol, and then tumble the mixture at 150 RPM for 30 minutes. Thereafter, throw in ***20 grams of lead dioxide,*** followed by ***20 grams of barium peroxide,*** and then continue to tumble the mixture for about 30 minutes at 150 RPM. Afterwards, add in ***390 grams of strontium peroxide,*** and then continue tumbling the mixture at 150 RPM for 30 minutes. After 30 minutes, remove the mixture from the ball mill, and then place the mixture onto a shallow pan and allow it air-dry until the odor of solvent is gone. Thereafter, place the mixture into a clean ball mill, and tumble the mixture with 100 grams of Teflon coated steel shot of 5 millimeters in diameter at 150 RPM for about 30 minutes to form a uniform mixture. Thereafter, the mixture is ready to go. To use, press the mixture into your tracer compartments on the backside of each projectile under high pressure of about 40,000 psi. Note: a small amount of a standard pyrotechnic igniter composition should then be pressed into the tracer cavity after the initial tracer composition to ensure proper ignition after firing the shell.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: *78% strontium peroxide, 7% calcium resinate, 7% calcium silicide, 4% lead dioxide, 4% barium peroxide*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in anti-aircraft guns ranging from 0.50 caliber (12.99mm) up to 25 millimeters.

05-01-008A: Long burning tracer composition containing depleted uranium for use in long range weapons such as sniper riffles, heavy machine guns, mortars, and artillery shells:
Into a suitable mixing bowl, blender, or suitable container utilizing a standard motorized stirrer equipped with plastic stir blade, place 150 milliliters of hexane, followed by ***375 grams of depleted uranium*** of 20 to 40 mesh, followed by ***62.5 grams of finely powdered aluminum/magnesium alloy,*** containing 50% aluminum and 50% magnesium, and then add in ***62.5 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 15 to 20 minutes. Thereafter, add in ***12 grams of any standard epoxy resin,*** and then continue to blend the mixture until the bulk of the hexane evaporates, and a pasty mass remains. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into any tracer cavity of any desirable projectile round, and then allowed to cure for a day or two. Thereafter, a standard tracer ignition composition should be pressed there into at 1000 psi.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¼
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.

Explosive ability: None.
Percentage: ***73.2% depleted uranium, 12.2% aluminum/magnesium alloy, 12.2% potassium perchlorate, 2.3% epoxy resin, 0.10% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in sniper riffles of up to .50 caliber, heavy machines guns ranging form 7.62 millimeters up to 18 millimeters, and in training rounds for artillery practice. Can also be used in 9-millimeter training rounds for anti-tank missile practice.

05-01-009A: High intensity illuminous tracer composition for use in riffles, heavy machine guns, and flares:
Into a suitable mixing bowl, blender, or suitable container utilizing a standard motorized stirrer equipped with plastic stir blade, place 150 milliliters of acetone, followed by ***50 grams of standard powdered magnesium***, followed by ***75 grams of yttrium nitrate***, and then add in ***25 grams of zirconium nitrate***, and then blend the mixture on moderate speed for about 15 to 20 minutes. Thereafter, add in 50 additional milliliters of acetone, followed by ***25 grams of calcium resinate***, followed by ***25 grams of lead sulpho-cyanate***, followed by ***50 grams of barium peroxide,*** and then continue to blend the mixture until the bulk of the acetone evaporates, and a pasty mass remains. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into any tracer cavity of any desirable projectile round, and then allowed to cure for a day or two. Thereafter, a standard tracer ignition composition should be pressed there into at 1000 psi.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% yttrium nitrate, 20% magnesium, 20% barium peroxide, 10% zirconium nitrate, 10% calcium resinate, 10% lead sulpho-cyanate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in riffles of up to .50 caliber, heavy machines guns, and in flares and illumination devices for aerial use.

05-01-009B: High intensity illuminous tracer composition for use in sniper riffles, heavy machine guns, and flares (modified):
Into a suitable mixing bowl, blender, or suitable container utilizing a standard motorized stirrer equipped with plastic stir blade, place 150 milliliters of acetone, followed by ***200 grams of standard powdered magnesium***, followed by ***50 grams of yttrium oxide (Y2O3)***, and then add in ***40 grams of zirconium oxide***, and then blend the mixture on moderate speed for about 15 to 20 minutes. Thereafter, add in 50 additional milliliters of acetone, followed by ***200 grams of calcium resinate***, followed by ***300 grams of sodium nitrate,*** followed by ***250 grams of strontium nitrate,*** and then continue to blend the mixture until the bulk of the acetone evaporates, and a pasty mass remains. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into any tracer cavity of any desirable projectile round, and then allowed to cure for a day or two. Thereafter, a standard tracer ignition composition should be pressed there into at 1000+ psi.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***28.8% sodium nitrate, 24% strontium nitrate, 19.2% calcium resinate, 19.2% magnesium, 4.8% yttrium oxide, 3.8% zirconium oxide, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in riffles of up to .50 caliber, heavy machines guns, and in flares and illumination devices for aerial use.

05-01-010A: High intensity illuminous tracer composition for use in riffles, heavy machine guns, rockets, grenade projectiles, and similar projectiles:
Into a vertical standing ball mill, filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter, place 150 milliliters of 95% ethyl alcohol, followed by ***300 grams of strontium nitrate***, followed by ***200 grams of cerium nitrate***, followed by ***5.5 grams of thorium nitrate***, followed by ***200 grams of standard magnesium powder***, followed by ***125 grams of calcium resinate***, and then rotate the mixture at 200 RPM for about 1 hour to form a uniform paste. Thereafter, place the entire mixture onto a shallow pan, and allow it to thoroughly air-dry. Once it has, place it into a clean horizontal ball mill, followed with 150 grams of Teflon coated steel shot of average diameter, and then tumble the mixture at 300 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use. To use, it simply needs to be pressed into any tracer cavity of any desirable projectile body under a press of 1500 to 3000 psi, and a standard tracer ignition composition pressed there into.
Burn rate: Average.

Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***36.1% strontium nitrate, 24%magnesium, 24% cerium nitrate, 15% calcium resinate, 0.66% thorium nitrate, 0.24% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in riffles, heavy machines guns, rockets, and other projectiles. May also be used in flares and illumination devices for aerial use.

05-01-010B: High intensity illuminous tracer composition for use in riffles, heavy machine guns, rockets, grenade projectiles, and similar projectiles (modified):
Into a vertical standing ball mill, filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter, place 150 milliliters of 95% ethyl alcohol, followed by ***250 grams of strontium nitrate***, followed by ***50 grams of cerium oxide***, followed by ***50 grams of thorium oxide***, followed by ***200 grams of standard magnesium powder***, followed by ***100 grams of calcium oxide***, and then followed by ***300 grams of sodium nitrate,*** and then rotate the mixture at 250 RPM for about 1 hour to form a uniform paste. Thereafter, place the entire mixture onto a shallow pan, and allow it to thoroughly air-dry. Once it has, place it into a clean horizontal ball mill, followed with 150 grams of Teflon coated steel shot of average diameter, and then tumble the mixture at 300 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use. To use, it simply needs to be pressed into any tracer cavity of any desirable projectile body under a pressure of 1500 to 3000 psi, and a standard tracer ignition composition pressed there into.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¼
Ease of ignition (1 to 10): 6 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***31.5% sodium nitrate, 26.3% strontium nitrate, 21% magnesium, 10.5% calcium oxide, 5.2% cerium oxide, 5.2% thorium oxide. 0.30% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in riffles, heavy machines guns, rockets, and other projectiles. May also be used in flares and illumination devices for aerial use.

05-01-011A: Tracer composition for use in high velocity projectiles fired by tanks, guns, and other firing weapons whereby the firer/soldier is utilizing laser optic sighting devices:
Into a suitable mixing bowl, blender, container, ect., equipped with the usual motorized stirrer or equivalent, place ***200 grams of standard powdered magnesium***, followed by ***100 grams of strontium nitrate***, followed by ***25 grams of sodium nitrate***, followed by ***25 grams of manganese dioxide***, followed by ***45 grams of finely divided red iron-III-oxide***, followed by ***75 grams of potassium nitrate***, and then add in 150 milliliters of ether, and then blend the mixture on moderate speed until the bulk of the ether evaporates. Once this point has been reached, add ***5 grams of ethyl cellulose***, followed by ***25 grams of Viton A binder***, and then blend the mixture for about 10 to 15 minutes at room temperature. Thereafter, the mixture is ready to be pressed. To do so, it simply needs to be pressed into any tracer cavity in the usual manner under a pressure of about 10,000 psi utilizing the normal techniques.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% magnesium, 20% strontium nitrate, 15% potassium nitrate, 9% iron-III-oxide, 5% sodium nitrate, 5% manganese dioxide, 5% Viton A binder, 1% ethyl cellulose***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for 25-millimeter rounds used by the US Armies M2 Bradley, and can be used in other high velocity ammunition for multiple uses.

05-01-011B: Tracer composition for use in high velocity projectiles fired by tanks, guns, and other firing weapons whereby the firer/soldier is utilizing laser optic sighting devices (modified):

Into a suitable mixing bowl, blender, container, ect., equipped with the usual motorized stirrer or equivalent, place ***200 grams of standard powdered magnesium***, followed by ***100 grams of strontium nitrate***, followed by ***25 grams of sodium nitrate***, followed by ***25 grams of polyvinyl chloride***, followed by ***50 grams of barium peroxide***, followed by ***75 grams of potassium perchlorate***, and then add in 150 milliliters of hexane, and then blend the mixture on moderate speed until the bulk of the hexane evaporates. Once this point has been reached, add ***25 grams of Viton A binder***, and then blend the mixture for about 10 to 15 minutes at room temperature. Thereafter, the mixture is ready to be pressed. To do so, it simply needs to be pressed into any tracer cavity in the usual manner under a pressure of about 10,000 psi utilizing the normal techniques.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% magnesium, 20% strontium nitrate, 15% potassium perchlorate, 10% barium peroxide, 5% sodium nitrate, 5% polyvinyl chloride, 5% Viton A binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for 25-millimeter rounds used by the US Armies M2 Bradley, and can be used in other high velocity ammunition for multiple uses.

05-01-012A: Tracer composition with increased red luminosity:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***190 grams of finely powdered magnesium***, followed by ***190 grams of strontium nitrate***, followed by ***136.5 grams of strontium tartrate***, followed by ***25 grams of hexachlorobenzene***, followed by ***4.5 grams of standard soft wood charcoal***, and then followed by ***25 grams of stearic acid***, and then tumble the mixture for about 45 minutes at 150 RPM. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into any tracer cavity under a pressure of about 30,000 psi, for use in any diameter projectile. The weight of the composition used varies on the diameter of the projectile, and the exact weight used should be tested by performing burn tests.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.2% strontium nitrate, 33.2% magnesium, 23.9% strontium tartrate, 4.3% hexachlorobenzene, 4.3% stearic acid, 0.78% wood charcoal, 0.32% combined impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for multiple projectiles.

05-01-013A: Green tracer composition with increased luminosity:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place 150 milliliters of diethyl ether or acetone, and then add in ***126 grams of barium nitrate***, followed by ***84 grams of magnesium powder***, followed by ***90 grams of hexachloroethane***, and then followed by ***6 grams of linseed oil***, and then blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow the mass to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams or more of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any tracer cavity under high pressure in the usual manner.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.1% barium nitrate, 29.4% hexachloroethane, 27.4% magnesium, 1.9% linseed oil, 0.2% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for multiple projectiles.

05-01-013B: Red tracer composition with increased luminosity:

Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place 150 milliliters of diethyl ether or acetone, and then add in ***120 grams of strontium nitrate***, followed by ***99 grams of magnesium powder***, followed by ***75 grams of hexachloroethane***, and then followed by ***6 grams of linseed oil***, and then blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow the mass to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams or more of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any tracer cavity under high pressure in the usual manner.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% strontium nitrate, 33% magnesium, 25% hexachloroethane, 2% linseed oil***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for multiple uses.

05-01-013C: Bluish-green tracer composition with high luminosity:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place 150 milliliters of diethyl ether or acetone, and then add in ***126 grams of barium nitrate***, followed by ***51 grams of magnesium powder***, followed by ***120 grams of hexachloroethane***, and then followed by ***3 grams of finely divided copper metal***, and then blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow the mass to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams or more of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any tracer cavity under high pressure in the usual manner.
Burn rate: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42% barium nitrate, 40% hexachloroethane, 17% magnesium, 1% copper***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for multiple uses.

05-01-014A: Tracer composition with reduced base drag:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place 150 milliliters of diethyl ether or acetone, and then add in ***36.5 grams of finely powdered magnesium of average mesh***, followed by ***41 grams of calcium resinate***, followed by ***50 grams of gelatin***, followed by ***354.5 grams of strontium peroxide***, and then followed by ***18 grams of finely powdered carbon black***, and then blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow the mass to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams or more of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any tracer cavity under high pressure in the usual manner.
Burn rate: 0.19 to 0.20 inches per second.
Burn temperature: 3500 Celsius.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70.9% strontium peroxide, 10% gelatin, 8.2% calcium resinate, 7.3% magnesium, 3.6% carbon black***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for 7.62 millimeter bullets, and 20 and 30 millimeter projectiles.

05-01-014B: Tracer composition with reduced base drag and increased burn range:
As in the previous procedure, place into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place 150 milliliters of diethyl ether or acetone, and then add in ***127 grams of finely powdered magnesium of average mesh***, followed by ***246.5***

grams of strontium nitrate, followed by ***50 grams of gelatin***, and then followed by ***76.5 grams of PVC***, and then blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow the mass to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams or more of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any tracer cavity under high pressure in the usual manner.
Burn rate: 0.08 to 0.10 inches per second.
Burn temperature: 2800 Celsius.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.3% strontium nitrate, 25.4%magnesium, 15.3% PVC, 10% gelatin***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer composition for 7.62 millimeter bullets, and 20 and 30 millimeter projectiles.

05-01-015A: White light tracer composition:
Into a suitable ball mill, or vertical mixer, filled with Teflon coated aluminum shot, place ***600 grams of atomized magnesium powder***, and then followed by ***400 grams of dry sodium nitrate***. Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl (after removing the aluminum shot), or blender, and then add in ***50 grams of "Laminac 4116 binder"***, and then blend the mixture for about 10 to 15 minutes at high speed in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desire bullet or projectile, and the resulting bullets/projectiles need to be cured at room temperature for several days in the usual manner.
Burn rate: Slow.
Water resistance: N/A.
Candle power: 400,000
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***57.14% magnesium powder, 38.09% sodium nitrate, 4.76% binder, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer for bullets, but preferably large caliber ammunition such as grenades and similar projectiles.

05-01-016A: White light tracer composition with sparkling effect:
Into an empty ball mill or vertical mixer, place ***500 grams of atomized aluminum powder***, followed by ***250 grams of coarse magnesium grains*** (0.5 to 1.5 millimeters in diameter), and then followed by 15 milliliters of linseed oil. Thereafter, tumble or rotate the mixture at 75 RPM for about 10 to 15 minutes. Thereafter, add in ***500 grams of dry sodium chlorate,*** followed by ***75 grams of potassium dichromate***, and then followed by ***90 grams of zinc oxide***. Thereafter, continue to tumble the mixture at 75 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, equipped with soft rubber stir blade, and then add in ***80 grams of "Laminac 4116 binder"***, and then blend the mixture for about 10 to 15 minutes at high speed in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desire bullet or projectile, and the resulting bullets/projectiles need to be cured at room temperature for several days in the usual manner.
Burn rate: Slow.
Water resistance: N/A.
Candle power: 400,000
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.44% aluminum powder, 33.44% sodium chlorate, 16.72% coarse magnesium grains, 6.02% zinc oxide, 5.35% binder, 5.01% potassium dichromate, 0.02% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer for large caliber ammunition such as grenades and similar projectiles.

05-01-017A: Specialty depleted uranium tracer composition for large caliber ammunition:

Into a suitable ball mill or vertical mixer, place ***250 grams of finely ground depleted uranium metal***, followed by ***125 grams of finely ground 50/50 aluminum magnesium alloy***. Thereafter, tumble the mixture at 150 RPM for about 30 minutes. Thereafter, place the mixture into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***125 grams of potassium perchlorate***. Thereafter, add in 150 milliliters of hexane, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile, and the resulting projectiles need to be cured at room temperature for several days until dry.
Burn rate: Slow.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% depleted uranium metal, 25% aluminum magnesium alloy, 25% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a spotting tracer composition for large caliber ammunition.
Note: depleted uranium is radioactive so caution should be maintained.

05-01-018A: Multi purpose tracer composition for various applications:
Into a suitable empty ball mill, or vertical mixer, place 5 milliliters of linseed oil, and then add in ***100 grams of magnesium powder***. Thereafter tumble or rotate the mixture at 75 RPM for about 10 minutes to coat the magnesium powder. Thereafter, place this coated magnesium into a suitable mixing drum, or bowl, equipped with motorized stirrer, in the usual manner, and then add in ***380 grams of barium peroxide***, and then followed by ***20 grams of aluminum stearate***. Thereafter, add in 150 milliliters of ether, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile, and the resulting projectiles need to be cured at room temperature for several days until dry.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***76% barium peroxide, 20% magnesium powder, 4% aluminum stearate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition.

05-01-018B: Multi purpose tracer composition for various applications:
Into a suitable empty ball mill, or vertical mixer, place 5 milliliters of linseed oil, and then add in ***120 grams of magnesium powder***. Thereafter tumble or rotate the mixture at 75 RPM for about 10 minutes to coat the magnesium powder. Thereafter, place this coated magnesium into a suitable mixing drum, or bowl, equipped with motorized stirrer, in the usual manner, and then add in ***367.5 grams of barium peroxide***, and then followed by ***12.5 grams of magnesium stearate***. Thereafter, add in 150 milliliters of ether, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile, and the resulting projectiles need to be cured at room temperature for several days until dry.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***73.5% barium peroxide, 24% magnesium powder, 2.5% magnesium stearate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition.

05-01-018C: Multi purpose tracer composition for various applications:
Into a suitable empty ball mill, or vertical mixer, place 5 milliliters of linseed oil, and then add in ***125 grams of magnesium powder***. Thereafter tumble or rotate the mixture at 75 RPM for about 10 minutes to coat the magnesium powder. Thereafter, place this coated magnesium into a suitable mixing drum, or bowl, equipped with motorized stirrer, in the usual manner, and then add in ***475 grams of barium peroxide***, and then followed by ***50 grams of zinc stearate***. Thereafter, add in 150 milliliters of ether, and then blend the

mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile, and the resulting projectiles need to be cured at room temperature for several days until dry.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***73.07% barium peroxide, 19.23% magnesium powder, 7.69% zinc stearate, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition.

05-01-019A: Tracer composition for high caliber projectiles:

Into a suitable empty ball mill, or vertical mixer, place ***300 grams of barium peroxide,*** followed by ***175 grams of antimony trisulfide,*** followed by ***20 grams of asphaltum,*** and then followed by ***5 grams of graphite powder***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours at room temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile under a pressure of 25,000 psi.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% barium peroxide, 35% antimony trisulfide, 4% asphaltum, 1% graphite powder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition.

05-01-020A: Specialty red tracer composition with red smoke trail for use in daytime operations:

Into a suitable empty ball mill, or vertical mixer, place ***350 grams of strontium peroxide,*** followed by ***50 grams of calcium resinate,*** followed by ***75 grams of 1-methylaminoanthraquinone,*** and then followed by ***25 grams of magnesium powder***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place the tumbled mixture into a suitable bowl, equipped with motorized stirrer, and then add in 100 milliliters of hexane. Thereafter, blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile under high pressure, and then cured at ordinary temperatures in the usual manner.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% strontium peroxide, 15% 1-methylaminoanthraquinone dye agent, 10% calcium resinate, 5% magnesium powder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition with a secondary smoke trail effect for daytime operations.

05-01-020B: Specialty tracer composition with red smoke trail for use in daytime operations only:

Into a suitable empty ball mill, or vertical mixer, place ***350 grams of strontium peroxide,*** followed by ***50 grams of calcium resinate,*** followed by ***50 grams of 1-methylaminoanthraquinone,*** and then followed by ***50 grams of ortho-dihydroxy benzene***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place the tumbled mixture into a suitable bowl, equipped with motorized stirrer, and then add in 100 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile under high pressure, and then cured at ordinary temperatures in the usual manner.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.

Explosive ability: None.
Percentage: ***70% strontium peroxide, 10% 1-methylaminoanthraquinone dye agent, 10% calcium resinate, 10% magnesium powder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition with a secondary smoke trail effect for daytime operations only (has little or no visibility at night).

05-01-020C: Specialty tracer composition with yellow smoke trail for use in daytime operations only:

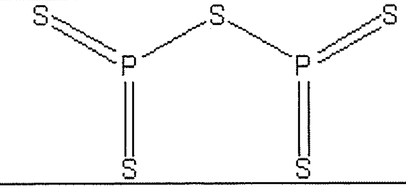
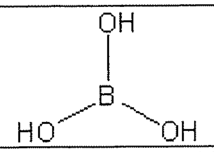
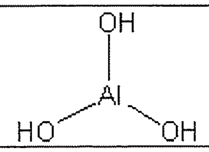
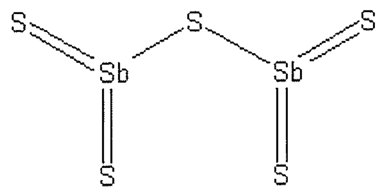
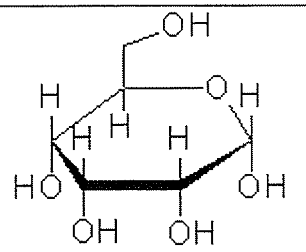
Into a suitable empty ball mill, or vertical mixer, place ***400 grams of strontium peroxide,*** followed by ***50 grams of calcium resinate,*** and then followed by ***50 grams of bis(para-dimethylaminophenyl)-methylenimine hydrochloride (auramine dye).*** Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place the tumbled mixture into a suitable bowl, equipped with motorized stirrer, and then add in 100 milliliters of 95% ethyl alcohol. Thereafter, blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile under high pressure, and then cured at ordinary temperatures in the usual manner.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% strontium peroxide, 10% auramine dye, 10% calcium resinate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition with a secondary smoke trail effect for daytime operations only (has little or no visibility at night).

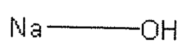
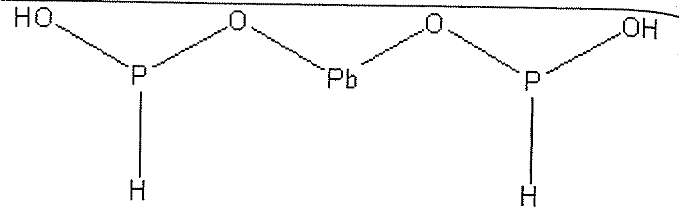
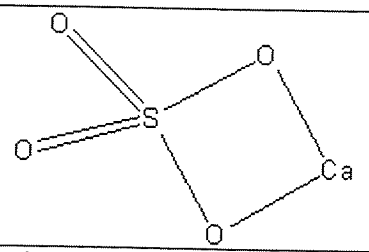
05-01-020D: Specialty tracer composition with black smoke trail for use in daytime operations:

Into a suitable empty ball mill, or vertical mixer, place ***350 grams of strontium peroxide,*** followed by ***50 grams of calcium resinate,*** followed by ***75 grams of anthracene,*** and then followed by ***25 grams of magnesium powder.*** Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place the tumbled mixture into a suitable bowl, equipped with motorized stirrer, and then add in 75 milliliters of hexane. Thereafter, blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into the tracer cavity of any desired projectile under high pressure, and then cured at ordinary temperatures in the usual manner.
Burn rate: Typical
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% strontium peroxide, 15% anthracene, 10% calcium resinate, 5% magnesium powder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a tracer composition for ammunition with a secondary smoke trail effect for daytime operations.

Section 2: Match-head Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide**
	
	Forms light yellow crystals with a strange odor. The crystals have melting point of 290 Celsius, and a boiling point of 515 Celsius. The crystals are insoluble in water, and are decomposed by it forming phosphoric acid and hydrogen sulfide. The crystals are soluble in carbon disulfide.
103. Boric acid	**104. Aluminum Hydroxide**
	
Boric acid forms colorless crystals or white granules or powder. The melting point of boric acid is about 171 Celsius, but transfer to boric oxide begins at higher temperatures. The solid is slightly soluble in water, and alcohol.	Forms a white bulky powder, which is insoluble in water and all known solvents. The solid breaks down into aluminum oxide when heated to high temperatures. Aluminum hydroxide is soluble in acids.
105. Antimony Pentasulfide	**106. Glucose**
	
Forms an orange-yellow solid. The solid is stable at room temperature and does not react with water. The powder is insoluble in water and most organic solvents. Antimony pentasulfide reacts with acids forming toxic hydrogen sulfide gas.	Glucose forms colorless, transparent crystals, or white granules, or powder. Glucose exists in several forms, but the main form has a melting point of 83 Celsius. The crystals are very soluble in water, but only slightly soluble in alcohol. Glucose is the main source of energy for all plants. Glucose can be prepared by inverting table sugar with dilute acids.
107. Sodium Hydroxide	**108. Lead Hypophosphite**

		
Sodium hydroxide forms white granules, lumps, or powder. The melting point is 318 Celsius. Sodium hydroxide is very soluble in water, and its dissolving in water generates much heat, so use caution. It is also readily soluble in alcohol. Sodium hydroxide is prepared by electrolysizing a solution of table salt in a divided cell.		Forms a hygroscopic crystalline powder or granules. The crystals are toxic, so users should use caution. The salt is insoluble in water and the usual solvents.
109. Calcium Sulfate		
		
Calcium sulfate forms white granules or powder. The anhydrous form is a white powder that reacts with water forming a series of hydrates. The hydrates are capable of setting to hard masses, such as plaster of Paris.		

- Match Head Compositions in this section -

1. 05-02-001A: Safety-match composition 1: *50% potassium chlorate, 12.5% standard animal glue binder, 12% siliceous microspheres, 9% manganese dioxide, 5.5% sulfur, 5.5 diatomaceous earth combustible, 2.5% ferric oxide coloring agent, 1% zinc oxide filler, 1% hydroxyethyl cellulose curative, 1% potassium dichromate catalyst*	**2. 05-02-001B: Safety-match (modified) composition 2:** *49.5% potassium chlorate, 30% siliceous microspheres, 12.5% standard animal glue binder, 5.5% sulfur, 1.1% hydroxyethyl cellulose curative, 1.1% potassium dichromate catalyst, 0.30% impurities*
3. 05-02-002A: “Strike anywhere” match composition 1: *35% potassium chlorate, 19% siliceous microspheres, 17% standard animal glue binder, 15.5% plaster of Paris, 7% Phosphorus Sesquisulphide, 6% zinc oxide, 0.50% dye*	**4. 05-02-002B: “Strike anywhere” (modified) match composition 2:** *40.4% potassium chlorate, 18.7% phenolic resin microspheres, 17.2% standard animal glue binder, 8.8% plaster of Paris, 8.2% Phosphorus Sesquisulphide, 6% zinc oxide, 0.32% dye, 0.380% impurities*
5. 05-02-003A: Match-book match composition 1: *55% potassium chlorate, 10% standard animal glue binder, 7.5% siliceous microspheres, 7.5% flour glass, 6.2% diatomaceous earth, 5% zinc oxide, 5% sulfur, 2.2% starch filler, 0.75% potassium dichromate, 0.50% gum Arabic, 0.25% dye, 0.10% impurities*	**6. 05-02-004A:“Double dip” friction resistant match stick composition 1:** *41.8% potassium chlorate, 13.3% standard animal glue binder, 13.35% flour glass, 8% sulfur, 7.8% plaster of Paris, 3.7% clay, 2.9% calcium resinate, 2.9% dye, 2.6% zinc oxide, 2.2% red phosphorus, 0.75% gun Arabic, 0.10% potassium dichromate, 0.60% impurities*
7. 05-02-005A: Clean burning match composition 1: *46% potassium chlorate, 23.5% glass powder, 13% standard animal glue, 5.8% diatomaceous earth, 3.5% graphite, 3.5% nitrocellulose, 2.3% dextrin, 1.2% dye, 0.70% boric acid*	**8. 05-02-006A: Quick-lite “easy light” weather proof match composition 1:** *48.5% potassium chlorate, 24.9% glass powder, 14.6% standard animal glue, 3.2% diatomaceous earth, 2.6% titanium dioxide, 1.3% wood pulp, 1.3% starch, 1.3% aluminum hydroxide, 1% moisture, 0.65% turpentine, 0.65% shellac,*
9. 05-02-007A: “Strike anywhere” match head composition 3: *49.7% potassium chlorate, 21.3% feldspar, 12.7% gelatin, 7.1% limestone, 2.8% red phosphorus, 2.7% starch, 2.7% titanium dioxide, 0.35% animal glue, 0.2% sodium dithionite, 0.450% residue*	**10. 05-02-007B: Safety match composition 3:** *54.4% potassium chlorate, 20.4% felspar, 6.8% iron oxide, 6.8% limestone, 4% gelatin, 4% starch, 2.7% animal glue, 0.5% red phosphorus, 0.09% Arylan PWS foaming agent, 0.31% residue*
11. 05-02-008A: Match striking composition for flares and similar devices: *31.7% condensation product of cresylic acid and paraformaldehyde with hexamethylenetetramine, 19.1% slate dust, 17.2% red phosphorus, 12.7% emery, 8.2% antimony sulfide, 6.3% glass powder, 4.4% chalk, 0.4% mixed impurities*	**12. 05-02-009A: Safety match composition:** *48.8% potassium chlorate, 23.9% lead hypophosphate, 13.6% lead nitrate, 12.6% animal glue, 0.79% ground glass, 0.18% gum benzoin, 0.13% mixed residues*
13. 05-02-010A: High heat producing match composition: *32.7% glass powder, 27.2% potassium chlorate, 16.3% magnetic iron oxide, 14.5% animal glue, 5.4% aluminum, 3.6% iron oxide, 0.30% impurities*	**14. 05-02-011A: Standard match composition:** *26.6% potassium chlorate, 18.6% glass powder, 14.6% ferrous peroxide, 14.6% zinc white, 13.3% animal glue, 12% phosphorus sesquisulfide, 0.30% balance*
15. 05-02-012A: Classic match composition: *27.5% potassium chlorate, 20.6% ground glass, 13.7% iron-III-oxide, 13.7% phosphorus trisulfide, 13.3% animal glue, 11% zinc oxide, 0.20% balance*	**16. 05-02-013A: Classic match composition with zinc hypothiophosphate burn increaser:** *27.9% potassium chlorate, 20.9% ground glass, 20.9% zinc hypothiophosphate, 13.4% animal glue, 8.3% iron-III-oxide, 8.3% zinc oxide, 0.30% balance*
17. 05-02-014A: Classic match composition with gum ammoniac binder: *33.8% potassium chlorate, 16.9% glass, 16.9% zinc oxide, 15.2% phosphorus sesquisulfide, 11.8% animal glue, 5% gum ammoniac, 0.40% mixed impurities*	**18. 05-02-015A: Classic match composition:** *45% potassium chlorate, 15% glass, 15% flours of sulfur, 12% diazobenzenesulfonic acid, 10% animal glue, 3% antimony sulfide*
19. 05-02-016A: Classic match composition (circa 1870): *59% potassium chlorate, 22% gelatin, 18% pumice, 1% iron protoxide*	**20. 05-02-017A: Friction resistant match composition:** *77% potassium chlorate, 15% ammonium sulfate, 8% glucose*
21. 05-02-018A: Classic waterproof match composition: *49% potassium chlorate, 29% powdered glass, 21% resorcin, 1% sodium hydroxide*	**22. 05-02-019A: Friction sensitive composition for use in matches:** *59% red phosphorus, 18% antimony sulfide, 11.5% gum acacia, 11.5% carbon black*
23. 05-02-020A: Friction sensitive composition for use in matches: *52.63% potassium chlorate, 14.03% calcium plumbate, 14.03% gum acacia, 7.01% powdered glass, 5.26% red phosphorus, 5.26% gum Arabic, 1.75% sulfur, 0.03% mixed residual balance*	**24. 05-02-021A: Friction sensitive composition for use in matches:** *42.34% potassium chlorate, 28.09% lead hypophosphite, 13.98% dye/pigment, 5.85% gum Arabic, 5.59% potassium dichromate, 4.12% red phosphorus, 0.03% residual balance*
25. 05-02-022A: Friction sensitive composition for use in “strike anywhere” matches: *39.21% potassium chlorate, 19.6% powdered glass, 12.74% glue, 11.76% whiting, 9.8% red phosphorus, 6.86% plaster of Paris, 0.03% mixed balance*	**26. 05-02-023A: Friction sensitive composition for use in matches:** *34.48% potassium chlorate, 17.24% antimony trisulfide, 17.24% lead nitrate, 8.62% vegetable charcoal, 8.62% red phosphorus, 8.62% potassium dichromate, 5.17% animal glue, 0.01% residual balance*
27. 05-02-024A: Friction sensitive composition for use in matches: *35.08% potassium chlorate, 22.8% glass powder, 12.28% animal glue, 12.28% zinc oxide, 7.01% red phosphorus, 5.26% lead hypophosphite, 3.5% gum benzoin, 1.75% sulfur, 0.04% mixed balance*	**28. 05-02-025A: Friction sensitive composition for use in matches:** *42.85% potassium chlorate, 20% powdered glass, 15.23% animal glue, 9.52% red phosphorus, 3.8% plaster of Paris, 3.8% zinc oxide, 2.85% sulfur, 1.9% whiting, 0.05% residue*
29. 05-02-026A: Classic match-head composition: *33.33% sand, 29.16% animal glue, 20.83% potassium perchlorate, 12.5% phosphorus sesqui-sulfide, 4.16% sulfur, 0.02% residual balance*	**30. 05-02-026B: Classic match-head composition:** *33.84% powdered sand, 30.76% ammonium perchlorate, 26.15% animal glue, 9.23% phosphorus sequi-sulfide, 0.02% residual balance*
31. 05-02-027A: Classic “safety” match-head composition: *30% potassium perchlorate, 27% powdered sand, 16% animal glue 10% magnesium/silicon alloy, 10% red phosphorus, 7% powdered chalk*	**32. 05-02-028A: Match composition for multiple uses:** *56.41% potassium chlorate, 35.89% composition 1, 7.69% composition 2, 0.01% mixed balance*
33. 05-02-029A: Weatherproof match composition: *38.09% potassium chlorate, 15.87% powdered glass, 15.87% powdered pumice stone, 9.52% sodium nitrate, 7.93% corn starch, 6.34% antimony trisulfide, 3.17% cascarilla bark, 1.58% animal glue, 1.58% lamp black, 0.05% mixed balance*	

05-02-001A Safety-match composition 1:
Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***50 grams of standard animal glue***, followed by ***10 grams of ferric oxide***, followed by ***4 grams of zinc oxide***, followed by ***4 grams of hydroxyethyl cellulose***, and then thoroughly blend the mixture on high for about 10 to 15 minutes. Thereafter, add in ***22 grams of flours of sulfur***, followed by ***22 grams of diatomaceous earth***, and then followed by ***48 grams of siliceous microspheres***, and then continue to thoroughly blend the mixture on high at room temperature for about 10 to 15 minutes. Afterwards, carefully add in ***36 grams of manganese dioxide***, followed by ***4 grams of potassium dichromate***, and then followed by ***200 grams of potassium chlorate***. Thereafter, continue to blend the mixture on high at room temperature for about 10 minutes. After 10 minutes, the mixture is ready to be cast. To cast the match

head composition, the semi-fluidized mixture should be placed into a small glass or cup, and the wood "matches" are then dipped and re-dipped into the semi-fluidized mixture. Thereafter, the wood matchsticks should then be cured for several days.

Burn rate: Moderate.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 7

Ease of ignition (1 to 10): 8 ½

Tendency to cake: None.

Explosive ability: None.

Percentage: ***50% potassium chlorate, 12.5% standard animal glue binder, 12% siliceous microspheres, 9% manganese dioxide, 5.5% sulfur, 5.5 diatomaceous earth combustible, 2.5% ferric oxide coloring agent, 1% zinc oxide filler, 1% hydroxyethyl cellulose curative, 1% potassium dichromate catalyst***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Matches, match heads, and as an igniter composition in smoke grenades.

05-02-001B: Safety-match (modified) composition 2:

Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***49.7 grams of standard animal glue***, followed by ***4.4 grams of hydroxyethyl cellulose***, and then thoroughly blend the mixture on high for about 30 minutes. Thereafter, add in ***22 grams of flours of sulfur***, followed by ***120 grams of siliceous microspheres***, and then continue to thoroughly blend the mixture on high at room temperature for about 10 to 15 minutes. After 10 to 15 minutes, carefully add in ***4.4 grams of potassium dichromate***, and then followed by ***197 grams of potassium chlorate***. Thereafter, continue to blend the mixture on high at room temperature for about 15 minutes. After 15 minutes, the mixture is ready to be cast. To cast the match head composition, the semi-fluidized mixture should be placed into a small glass or cup, and the wood "matches" are then dipped and re-dipped into the semi-fluidized mixture. Thereafter, the wood matchsticks should then be cured for several days.

Burn rate: Moderate.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 7

Ease of ignition (1 to 10): 8 ½

Tendency to cake: None.

Explosive ability: None.

Percentage: ***49.5% potassium chlorate, 30% siliceous microspheres, 12.5% standard animal glue binder, 5.5% sulfur, 1.1% hydroxyethyl cellulose curative, 1.1% potassium dichromate catalyst, 0.30% impurities***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Matches, match heads, and as an igniter composition in smoke grenades.

05-02-002A: "Strike anywhere" match composition 1:

Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***68 grams of standard animal glue***, followed by ***24 grams of zinc oxide***, followed by ***2 grams of any desired dye*** (use the color of your choice), and then followed by ***62 grams of plaster of Paris***, and then thoroughly blend the mixture on high for about 10 to 15 minutes. Thereafter, add in ***28 grams of Phosphorus Sesquisulphide***, followed by ***76 grams of siliceous microspheres***, and then continue to thoroughly blend the mixture on high at room temperature for about 10 to 15 minutes. Afterwards, carefully add in ***140 grams of potassium chlorate***, and then continue to blend the mixture on high at room temperature for about 10 minutes. After 10 minutes, the mixture is ready to be cast. To cast the match head composition, the semi-fluidized mixture should be placed into a small glass or cup, and the wood "matches" are then dipped and re-dipped into the semi-fluidized mixture as many times as possible. Thereafter, the wood matchsticks should then be cured for several days.

Burn rate: Above moderate.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8

Ease of ignition (1 to 10): 9

Tendency to cake: None.

Explosive ability: None.

Percentage: ***35% potassium chlorate, 19% siliceous microspheres, 17% standard animal glue binder, 15.5% plaster of Paris, 7% Phosphorus Sesquisulphide, 6% zinc oxide, 0.50% dye***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Matches, match heads, and as an igniter composition in smoke grenades, and other similar pyrotechnic munitions.

05-02-002B: "Strike anywhere" (modified) match composition 2:

Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***68.8 grams of standard animal glue***, followed by ***24 grams of zinc oxide***, followed by ***1.3 grams of any desired dye*** (use the color of your choice), and then followed by ***35 grams of plaster of Paris***, and then thoroughly blend the mixture on high for about 10 to 15 minutes. Thereafter, add in ***33 grams of Phosphorus Sesquisulphide***, followed by ***74.8 grams of phenolic resin microspheres***, and then continue to thoroughly blend the mixture on high at room temperature for about 10 to 15 minutes. Afterwards, carefully add in ***161 grams of potassium chlorate***. Thereafter, continue to blend the mixture on high at room temperature for about 10 minutes. After 10 minutes, the mixture is ready to be cast. To cast the match head composition, the semi-fluidized mixture should be placed into a small glass or cup, and the wood "matches" are then dipped and re-dipped into the semi-fluidized mixture. Thereafter, the wood matchsticks should then be cured for several days.

Burn rate: Above moderate

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8

Ease of ignition (1 to 10): 9

Tendency to cake: None.

Explosive ability: None.

Percentage: ***40.4% potassium chlorate, 18.7% phenolic resin microspheres, 17.2% standard animal glue binder, 8.8% plaster of Paris, 8.2% Phosphorus Sesquisulphide, 6% zinc oxide, 0.32% dye, 0.380% impurities***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Matches, match heads, and as an igniter composition in smoke grenades, and other similar pyrotechnic munitions.

05-02-003A: Matchbook match composition 1:

Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***40 grams of standard animal glue***, followed by ***20 grams of zinc oxide***, followed by ***1 grams of any desired dye*** (use the color of your choice), followed by ***25 grams of diatomaceous earth***, and then followed by ***2 grams of gum Arabic,*** and then thoroughly blend the mixture on high for about 30 minutes. Thereafter, add in ***30 grams of flour glass***, followed by ***30 grams of siliceous microspheres***, followed by ***20 grams of flours of sulfur,*** and then followed by ***9 grams of powdered starch,*** and then continue to thoroughly blend the mixture on high at room temperature for about 10 to 15 minutes. Afterwards, carefully add in ***3 grams of potassium dichromate,*** and then followed by ***220 grams of potassium chlorate***. Thereafter, continue to blend the mixture on high at room temperature for about 10 minutes. After 10 minutes, the mixture is ready to be cast. To cast the match head composition, the semi-fluidized mixture should be placed into a small glass or cup, and the paper/cardboard "matches" are then dipped and re-dipped into the semi-fluidized mixture. Thereafter, the matchsticks should then be cured for several days.

Burn rate: Above moderate

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 8

Ease of ignition (1 to 10): 9

Tendency to cake: None.

Explosive ability: None.

Percentage: ***55% potassium chlorate, 10% standard animal glue binder, 7.5% siliceous microspheres, 7.5% flour glass, 6.2% diatomaceous earth, 5% zinc oxide, 5% sulfur, 2.2% starch filler, 0.75% potassium dichromate, 0.50% gum Arabic, 0.25% dye, 0.10% impurities***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Matches, match heads, and as an igniter composition in smoke grenades, and other similar pyrotechnic munitions.

05-02-004A: "Double dip" friction resistant matchstick composition 1:

Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***53 grams of standard animal glue***, followed by ***10.4 grams of zinc oxide***, followed by ***11.8 grams of any desired dye*** (use the color of your choice), followed by ***11.8 grams of calcium resinate***, followed by ***3 grams of gum Arabic,*** and then followed by ***14.8 grams of powdered clay,*** and then thoroughly blend the mixture on high for about 10 to 15 minutes. Thereafter, add in ***32 grams of sulfur, 53 grams of flour glass***, followed by ***31 grams of fresh finely divided plaster of Paris (non moistened)***, and then followed by ***9 grams of red phosphorus,*** and then continue to thoroughly blend the mixture on high at room temperature for about 10 to 15 minutes. Afterwards, carefully add in ***400 milligrams of potassium dichromate,*** and then followed by ***166 grams of potassium chlorate***. Thereafter, continue to blend the mixture on high at room temperature for about 10 to 15 minutes. After 10 to 15 minutes, the mixture is ready to be cast. To cast the match head composition, the semi-fluidized mixture should be placed into a small glass or cup, and the paper/cardboard "matches" are then dipped and re-dipped into the semi-fluidized mixture. Thereafter, the matchsticks should then be cured for several days, and then a friction sensitive priming composition, or any suitable friction sensitive composition should be attached to the head of the match composition.

Burn rate: Moderate.

Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.8% potassium chlorate, 13.3% standard animal glue binder, 13.35% flour glass, 8% sulfur, 7.8% plaster of Paris, 3.7% clay, 2.9% calcium resinate, 2.9% dye, 2.6% zinc oxide, 2.2% red phosphorus, 0.75% gun Arabic, 0.10% potassium dichromate, 0.60% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Matches, match heads, and as an igniter composition in smoke grenades, and other similar pyrotechnic munitions.

05-02-005A: Clean burning match composition 1:

Into a mixing blender, equipped with a plastic mixing blade, preferably a Teflon blade, place ***50.8 grams of standard animal glue***, followed by ***2.8 grams of boric acid***, followed by ***4.8 grams of any desired dye*** (use the color of your choice), followed by ***23 grams of diatomaceous earth***, and then followed by ***9 grams of dextrin***, and then thoroughly blend the mixture on high for about 10 to 15 minutes. Thereafter, add in ***14 grams of powdered graphite***, followed by ***92 grams of glass powder***, and then continue to thoroughly blend the mixture on high at room temperature for about 10 to 15 minutes. Afterwards, carefully add in ***180 grams of potassium chlorate***, and then slowly and carefully add in, ***14 grams of nitrocellulose*** (200 microns) ***wetted with 5.6 milliliters of water–19.6 grams total weight*** (40% moistened nitrocellulose, commercially available). Note: you may have to grind up the moistened nitrocellulose prior to mixing to obtain the desired micron size. Thereafter, continue to blend the mixture on high at room temperature for about 10 to 15 minutes. After 10 to 15 minutes, the mixture is ready to be cast. To cast the match head composition, the semi-fluidized mixture should be placed into a small glass or cup, and the paper/cardboard "matches" are then dipped and re-dipped into the semi-fluidized mixture. Thereafter, the matchsticks should then be cured for several days.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46% potassium chlorate, 23.5% glass powder, 13% standard animal glue, 5.8% diatomaceous earth, 3.5% graphite, 3.5% nitrocellulose, 2.3% dextrin, 1.2% dye, 0.70% boric acid***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Matches, match heads, and as an igniter composition in smoke grenades, and other similar pyrotechnic munitions.

05-02-006A: Quick-lite "easy light" weather proof match composition 1:

Into a suitable beaker or glass container, place ***112 grams of standard animal glue***, followed by 168 milliliters of warm water. Thereafter, rapidly stir the mixture to form a uniform glue mixture. Thereafter, heat this glue solution to 80 Celsius while constantly stirring. When its temperature reaches 80 Celsius, gently add in ***370 grams of potassium chlorate*** while stirring the glue solution. After the addition of the glue, heat and stir the mixture at 80 Celsius for about 30 minutes. Afterwards, stir in an additional 100 milliliters of water, and then continue heating and stirring, but after addition of the water, reduce the heat to 50 Celsius. When the heat is reduced to 50 Celsius, add in all at once (while continuously and vigorously stirring) a separate mixture (which you should pre-prepare before the glue/potassium chlorate mixture) prepared by adding to a ball mill with 100 grams of Teflon coated steel shot of 5 millimeters in diameter at room temperature, ***5 grams of shellac, 5 grams of turpentine, 10 grams of powdered wood pulp, 10 grams of starch, 190 grams of glass powder, 20 grams of titanium dioxide, 25 grams of diatomaceous earth, and finally 10 grams of aluminum hydroxide*** at 200 RPM for 30 minutes. Now, after adding in this mixture to the glue/potassium chlorate mixture, continue to thoroughly stir the entire combined mixture at 50 Celsius for about 30 minutes. After 30 minutes, add in ***5 grams of vinyl acetate*** and continue to heat and stir at 50 Celsius for about 10 minutes. After 10 minutes, add in 150 milliliters of hot water, and then continue to heat and stir the mixture at 50 Celsius for about 15 minutes. After 15 minutes, the mixture is ready to be cast. To do so, dip your cardboard/wood matchsticks into the hot mixture, let them dry, then re-dip and dry several more times or so. The final dipped and dried matches should be cured for 24 hours. During the dipping process, continue to heat, but not stir the mixture at 50 Celsius.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48.5% potassium chlorate, 24.9% glass powder, 14.6% standard animal glue, 3.2% diatomaceous earth, 2.6% titanium dioxide, 1.3% wood pulp, 1.3% starch, 1.3% aluminum hydroxide, 1% moisture, 0.65% turpentine, 0.65% shellac***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Matches, match heads, and as an igniter composition in smoke grenades, and other similar pyrotechnic munitions.

05-02-007A: "Strike anywhere" match head composition 3:

Into a suitable beaker or glass container, equipped with motorized stirrer using a plastic stir blade, place ***62 grams of gelatin***, followed by ***13.5 grams of food grade starch***, followed by ***103.5 grams of finely divided feldspar***, followed by ***1.7 grams of animal glue***, followed by ***13.5 grams of titanium dioxide***, followed by ***34.5 grams of finely ground limestone***, and then followed by ***1 gram of sodium dithionite***, and then rapidly blend the mixture for about 15 to 30 minutes. After 15 to 30 minutes, add in ***241.5 grams of potassium chlorate***, and then continue blending the mixture on moderate speed for about 10 minutes. After 10 minutes, add in ***13.8 grams of red phosphorus***, and then followed by 20 milliliters of cold water, and then continue to blend the mixture on moderate speed for about 15 to 30 minutes to form a uniform mixture. After stirring, the mixture is ready to be used. To use, your match sticks need to be dipped, dried, and then re-dipped and then dried several more times.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.7% potassium chlorate, 21.3% feldspar, 12.7% gelatin, 7.1% limestone, 2.8% red phosphorus, 2.7% starch, 2.7% titanium dioxide, 0.35% animal glue, 0.2% sodium dithionite, 0.450% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in making matches of various sizes.

05-02-007B: Safety match composition 3:

Into a suitable beaker or glass container, equipped with motorized stirrer using a plastic stir blade, place ***20 grams of gelatin***, followed by ***20 grams of food grade starch***, followed by ***101.5 grams of finely divided feldspar***, followed by ***13.5 grams of animal glue***, followed by ***33.8 grams of iron oxide***, followed by ***450 milligrams of Arylan PWS***, and then followed by ***33.8 grams of finely ground limestone***, and then rapidly blend the mixture for about 15 to 30 minutes. After 15 to 30 minutes, add in ***270 grams of potassium chlorate***, and then continue blending the mixture on moderate speed for about 30 minutes. After 30 minutes, add in ***2.5 grams of red phosphorus***, and then followed by 5 milliliters of cold water, and then continue to blend the mixture on moderate speed for about 15 to 30 minutes to form a uniform mixture. After stirring, the mixture is ready to be used. To use, your match sticks need to be dipped, dried, and then re-dipped and then dried several more times.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54.4% potassium chlorate, 20.4% feldspar, 6.8% iron oxide, 6.8% limestone, 4% gelatin, 4% starch, 2.7% animal glue, 0.5% red phosphorus, 0.09% Arylan PWS foaming agent, 0.31% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in making matches of various sizes.

05-02-008A: Match striking composition for flares and similar devices:

Into a suitable size mixing bowl, blender, or equivalent, equipped with proper motorized stirrer, place ***600 milliliters of cresylic acid***, followed by ***81 grams of hexamethylenetetramine***, and then blend the mixture for about 30 minutes to form a uniform mix. Now, into a clean ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***272 grams of paraformaldehyde***, followed by ***489 grams of red phosphorus***, followed by ***235 grams of black antimony sulfide***, followed by ***544 grams of slate dust***, followed by ***362 grams of finely divided emery***, followed by ***181 grams of glass powder***, followed by ***127 grams of finely divided chalk***, and then tumble the mixture at 150 RPM for about 30 minutes at room temperature. Thereafter, place this dry tumbled mixture into the mixing bowl containing the cresylic acid and hexamethylenetetramine, and then blend the mixture on high speed to form a uniform pasty mass. Now, the pasty mass should be pressed into mold of any desirable shape, but most likely in the shape of discs, cubes, or rods, depending on the size of the flare or smoke tube body. Thereafter, these molds should be placed into an autoclave, and heated to 135 Celsius for about 2 hours. Thereafter, remove the molds, once they have cooled, and then remove the pressed compositions. Note: Teflon coated molds work best, so as to remove the striking composition without trouble.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9+ (based on striking the composition).
Tendency to cake: None.
Explosive ability: None.
Percentage: *31.7% condensation product of cresylic acid and paraformaldehyde with hexamethylenetetramine, 19.1% slate dust, 17.2% red phosphorus, 12.7% emery, 8.2% antimony sulfide, 6.3% glass powder, 4.4% chalk, 0.4% mixed impurities*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in road flares, smoke grenades, and other devices that are initiated by "striking" the device/composition on a suitable surface.

05-02-009A: Safety match composition:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***68 grams of standard animal glue***, followed by 45 milliliters of water, and then followed by ***22 grams of lead nitrate***, and then blend the mixture for about 5 minutes to dissolve the solids. Thereafter, add in 22 grams of 95% ethyl alcohol, followed by ***1 gram of gum benzoin***, and then continue to blend the mixture for about 5 to 10 minutes. Thereafter, add in ***263 grams of potassium chlorate***, followed by ***129 grams of lead hypophosphate***, followed by ***51.6 grams of lead nitrate***, followed by ***4.3 grams of ground glass***, and then continue to blend the mixture for about 10 to 15 minutes. Thereafter, add in about 20 milliliters of hot water, and then continue to blend the mixture for about 5 minutes to form a pasty mass. After 5 minutes, the mixture is ready to be used. To do so, the wooden match sticks simply need to be dipped into the mixture and then allowed to cure for a day or so.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 6 (based on striking the composition).
Tendency to cake: None.
Explosive ability: None.
Percentage: *48.8% potassium chlorate, 23.9% lead hypophosphate, 13.6% lead nitrate, 12.6% animal glue, 0.79% ground glass, 0.18% gum benzoin, 0.13% mixed residues*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches that are hard to ignite, and only ignite on proper surfaces such as a flint or "sand paper" type surfaces.

05-02-010A: High heat producing match composition:
Into a suitable mixing bowl, container, or similar container, equipped with motorized stirrer, place ***15 grams of finely powdered aluminum*** of average mesh, followed by ***10 grams of finely powdered red iron-III-oxide***, and then add in 150 milliliters of diethyl ether, and then blend the mixture for about 5 to 10 minutes. Thereafter, add in ***75 grams of potassium chlorate***, followed by ***45 grams of magnetic iron oxide***, followed by ***90 grams of glass powder***, and then continue to blend the mixture on moderate speed until the bulk of the solvent evaporates. Once this point is achieved, place 90 milliliters of warm water into a large suitable beaker, and then add and dissolve ***40 grams of standard animal glue***, and then blend the mixture for about 4 minutes to form uniform binder mixture. Now, add in the previously blended mixture containing the potassium chlorate, and then blend the entire combined mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the wood sticks should be dipped, and re-dipped as many times as necessary, and then the matches should be allowed to dry for several days or more. Instead of using matchsticks, the compositions can be poured and pressed into pellets, discs, tablets, or any other desirable shape in the usual manner.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 6 (based on striking the composition).
Tendency to cake: None.
Explosive ability: None.
Percentage: *32.7% glass powder, 27.2% potassium chlorate, 16.3% magnetic iron oxide, 14.5% animal glue, 5.4% aluminum, 3.6% iron oxide, 0.30% impurities*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make specialty matches for igniting wet or hard to ignite materials. Can also be used in smoke grenade and other similar devices.

05-02-011A: Standard match composition:
Into a suitable beaker or similar container, place ***108 grams of phosphorus sesquisulfide***, followed by ***240 grams of potassium chlorate***, followed by ***132 grams of ferrous peroxide***, followed by ***132 grams of finely divided zinc white***, followed by ***168 grams of glass powder***, followed by ***120 grams of standard animal glue***, and then followed by 350 milliliters of water. Thereafter, manually blend the mixture using a plastic spatula for abut 20 to 30 minutes to form a uniform mixture. Thereafter, the mixture is ready for use.

To use, the wood sticks should be dipped, and re-dipped as many times as necessary, and then the matches should be allowed to dry for several days or more. Instead of using matchsticks, the composition can be poured and pressed into pellets, discs, tablets, or any other desirable shape in the usual manner, and then cured for various purposes.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *26.6% potassium chlorate, 18.6% glass powder, 14.6% ferrous peroxide, 14.6% zinc white, 13.3% animal glue, 12% phosphorus sesquisulfide, 0.30% balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make matches. Can also be used in smoke grenades and other similar fuses.

05-02-012A: Classic match composition:
Into a suitable empty ball mill, place ***120 grams of phosphorus trisulfide (P2S3)***, followed by ***96 grams of powdered zinc oxide***, and then tumble the mixture for about 15 minutes at 150 RPM. Thereafter, throw in ***240 grams of potassium chlorate***, and followed by ***120 grams of red iron-III-oxide***, and then continue to tumble the mixture for about 10 minutes at 100 RPM. Thereafter, place the tumbled mixture into a clean beaker or suitable container, equipped with a motorized stirrer utilizing plastic stir blades, and then add in ***180 grams of ground glass***, followed by ***116 grams of standard animal glue***, and then followed by 300 milliliters of warm water. Thereafter, blend the mixture on moderate speed for about 30 to 40 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the wood sticks should be dipped, and re-dipped as many times as necessary, and then the matches should be allowed to dry for several days or more. Instead of using matchsticks, the composition can be poured and pressed into pellets, discs, tablets, or any other desirable shape in the usual manner, and then cured for various purposes.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *27.5% potassium chlorate, 20.6% ground glass, 13.7% iron-III-oxide, 13.7% phosphorus trisulfide, 13.3% animal glue, 11% zinc oxide, 0.20% balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make matches. Can also be used in smoke grenades and other similar fuses.

05-02-013A: Classic match composition with zinc hypothiophosphate burn increaser:
Into a suitable empty ball mill, place ***180 grams of zinc hypothiophosphate***, followed by ***240 grams of potassium chlorate***, followed by ***72 grams of red iron-III-oxide***, followed by ***72 grams of zinc oxide***, and then tumble the mixture for about 10 minutes at 100 to 150 RPM. Thereafter, place the tumbled mixture into a clean beaker or suitable container, equipped with a motorized stirrer utilizing plastic stir blades, and then add in ***180 grams of ground glass***, followed by ***116 grams of standard animal glue***, and then followed by 300 milliliters of warm water. Thereafter, blend the mixture on moderate speed for about 30 to 40 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the wood sticks should be dipped, and re-dipped as many times as necessary, and then the matches should be allowed to dry for several days or more. Instead of using matchsticks, the composition can be poured and pressed into pellets, discs, tablets, or any other desirable shape in the usual manner, and then cured for various purposes.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 ½ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *27.9% potassium chlorate, 20.9% ground glass, 20.9% zinc hypothiophosphate, 13.4% animal glue, 8.3% iron-III-oxide, 8.3% zinc oxide, 0.30% balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make matches. Can also be used in smoke grenades and other similar fuses.

05-02-014A: Classic match composition with gum ammoniac binder:

Into a suitable beaker or similar container, equipped with motorized stirrer, place 230 milliliters of warm water, and then add in ***27.2 grams of gum ammoniac***, followed by ***63.5 grams of standard animal glue***, and then blend the mixture for about 10 to 15 minutes to form an emulsion. Thereafter, add in ***181 grams of potassium chlorate***, followed by ***90.7 grams of zinc oxide***, followed by ***81.6 grams of phosphorus sesquisulfide***, and then followed by ***90.7 grams of powdered glass***, and then continue to blend the mixture on moderate speed for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, the matchsticks can be dipped and re-dipped as many times as desired, followed by curing at room temperature or in an oven. The composition can also be pressed into pellets, discs, tablets, or any desired container or mold in the usual manner.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8 ¾ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *33.8% potassium chlorate, 16.9% glass, 16.9% zinc oxide, 15.2% phosphorus sesquisulfide, 11.8% animal glue, 5% gum ammoniac, 0.40% mixed impurities*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make matches. Can also be used in smoke grenades and other similar fuses.

05-02-015A: Classic match composition:

Into a suitable beaker or similar container, equipped with motorized stirrer, place 150 milliliters of warm water, and then add and dissolve ***30 grams of standard animal glue***. Thereafter, add in ***45 grams of fours of sulfur***, followed by ***9 grams of antimony sulfide***, followed by ***36 grams of anhydrous diazobenzenesulfonic acid***, and then blend the mixture for about 10 minutes. Thereafter, add in ***45 grams of powdered glass***, followed by ***135 grams of potassium chlorate,*** and then continue to blend the mixture on moderate speed for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, the matchsticks can be dipped and re-dipped as many times as desired, followed by curing at room temperature or in an oven. The composition can also be pressed into pellets, discs, tablets, or any desired container or mold in the usual manner.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *45% potassium chlorate, 15% glass, 15% flours of sulfur, 12% diazobenzenesulfonic acid, 10% animal glue, 3% antimony sulfide*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make matches. Can also be used in smoke grenades and other similar fuses.

05-02-016A: Classic match composition (circa 1870):

First, the wooden matchsticks should be lightly coated with paraffin wax, by simply dipping them into molten paraffin wax. Once the dried coated match sticks are ready, the composition is readily prepared by placing into a suitable mixing bowl, or blender, equipped with motorized stirrer or other stirring means in the usual manner, ***110 grams of gelatin***, followed by 325 milliliters of a 10% acetic acid solution, followed by ***6.5 grams of iron protoxide***, and then stir the mixture for about 10 minutes to dissolve the gelatin. Thereafter, add in ***90 grams of ground pumice***, followed by ***300 grams of potassium chlorate***, and then continue to blend the mixture for about 1 hour to form a uniform paste. Thereafter, the paste is ready for use. To use, the paraffin coated match sticks simply need to be dipped and re-dipped as many times as possible, and then dried each time in the usual manner.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *59% potassium chlorate, 22% gelatin, 18% pumice, 1% iron protoxide*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make matches. Can also be used in fuses.

05-02-017A: Friction resistant match composition:

Into a suitable beaker or similar container, equipped with motorized stirrer, place 150 milliliters of diethyl ether, followed by ***10 grams of finely ground glucose***, and then stir the mixture for about 5 minutes to form a suspension. Thereafter, add in ***20 grams of ammonium sulfate***, and then blend the mixture for about 10 minutes on moderate speed. Thereafter, add in ***100 grams of potassium chlorate***, and then continue to blend the mixture for about 30 minutes at room temperature. Thereafter, heat the mixture to 100 Celsius and allow about half the water to evaporate. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, blend the mixture for about 5 minutes to form a uniform paste. Thereafter, the mixture is ready for use. To use, the matchsticks need to be dipped and re-dipped as many times as possible. The matchsticks need to be thoroughly dried after each dipping. Note: this match will not ignite upon friction, and must be primed with a suitable ignition composition.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *77% potassium chlorate, 15% ammonium sulfate, 8% glucose*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make matches, but is primarily used in fuses for grenades and other devices.

05-02-018A: Classic waterproof match composition:

Into a suitable beaker or similar container, equipped with motorized stirrer, place ***75 grams of resorcin***, followed by ***75 grams of a 38 to 40% formaldehyde solution,*** followed by ***70 grams of a 20% sodium hydroxide solution***, followed by ***175 grams of potassium chlorate***, and then followed by ***105 grams of finely powdered glass***, and then blend the mixture for about 30 minutes at room temperature. Thereafter, the mixture is ready for use. To use, the matchsticks need to be dipped and re-dipped as many times as possible. The matchsticks need to be thoroughly dried after each dipping.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *49% potassium chlorate, 29% powdered glass, 21% resorcin, 1% sodium hydroxide*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make weatherproof matches.

05-02-019A: Friction sensitive composition for use in matches:

Into a suitable ball mill, filled with 150 grams of more of Teflon coated steel shot of 1 to 2 millimeters in diameter, place ***500 grams of red phosphorus***, followed by ***150 grams of antimony sulfide***, followed by ***100 grams of gum acacia***, and then followed by ***100 grams of carbon black***. Thereafter, tumble the mixture at 75 to 100 RPM for about 1 hour at room temperature. Thereafter, place the finely divided mixture into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, and then add in about 50 milliliters of cold water, and then blend the mixture for about 15 minutes on moderate speed to form a paste. Thereafter, dip the match sticks into the paste and then allow the sticks to thoroughly dry. If desired, the paste can be dried on a shallow pan or tray and then pressed into tablets or pellets.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: *59% red phosphorus, 18% antimony sulfide, 11.5% gum acacia, 11.5% carbon black*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches for multiple uses.

05-02-020A: Friction sensitive composition for use in matches:

Into a suitable empty ball mill, or vertical mixer, place ***25 grams flours of sulfur***, followed by ***200 grams of calcium plumbate***, followed by ***200 grams of gum acacia***, followed by ***75 grams of red phosphorus***, and then followed by ***75 grams of gum Arabic***. Thereafter, tumble or rotate the mixture at 150 RPM for about 3 hours. Now, place this tumbled or rotated mixture into a suitable mixing drum, equipped with motorized stirrer, in the usual manner, and then add in ***750 grams of potassium chlorate***, followed by

100 grams of powdered glass. Thereafter, add in 300 milliliters of warm water, and then blend then entire mixture to form a paste. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over an over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.63% potassium chlorate, 14.03% calcium plumbate, 14.03% gum acacia, 7.01% powdered glass, 5.26%red phosphorus, 5.26% gum Arabic, 1.75% sulfur, 0.03% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-021A: Friction sensitive composition for use in matches:
Into a suitable beaker or similar container, place 44 milliliters of warm water, and then add and dissolve ***22 grams of gum Arabic***. Thereafter, add in ***21 grams of potassium dichromate***, followed by ***15.5 grams of red phosphorus***, followed by ***105.5 grams of lead hypophosphite***, followed by ***52.5 grams of any desired color dye or pigment***, followed by 79 milliliters of cold water, and then followed by ***159 grams of potassium chlorate***. Thereafter, blend the mixture on moderate speed for about 1 hour to form a uniform paste. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over an over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.34% potassium chlorate, 28.09% lead hypophosphite, 13.98% dye/pigment, 5.85% gum Arabic, 5.59% potassium dichromate, 4.12% red phosphorus, 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-022A: Friction sensitive composition for use in "strike anywhere" matches:
Into a suitable empty ball mill or vertical mixer, place ***400 grams of potassium chlorate***, followed by ***200 grams of powdered glass***, followed by ***120 grams of "whiting",*** followed by ***70 grams of plaster of Paris*** powder, ***130 grams of glue***, followed by 130 milliliters of warm water. Thereafter, tumble the mixture at 150 RPM for about 2 hours. Thereafter, add in ***100 grams of red phosphorus***, and then continue to tumble the mixture at 200 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over an over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.21% potassium chlorate, 19.6% powdered glass, 12.74% glue, 11.76% whiting, 9.8% red phosphorus, 6.86% plaster of Paris, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-023A: Friction sensitive composition for use in matches:
Into a suitable beaker or similar container, place 175 milliliters of water, and then add in ***30 grams of standard animal glue***. Thereafter, boil the mixture at 100 Celsius for about 15 minutes. Thereafter, remove the heat source and allow the mixture to slowly cool to room temperature. Stir the mixture during the cool down period. Thereafter, into a suitable empty ball mill or vertical mixer, place ***100 grams of antimony trisulfide***, followed by ***100 grams of lead nitrate***, followed by ***50 grams of red phosphorus,*** followed by ***50 grams of vegetable charcoal***, and then followed by ***50 grams of potassium dichromate***. Thereafter, tumble the mixture at 150 RPM for about 2 hours. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***200 grams of potassium chlorate***, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over and over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***34.48% potassium chlorate, 17.24% antimony trisulfide, 17.24% lead nitrate, 8.62% vegetable charcoal, 8.62% red phosphorus, 8.62% potassium dichromate, 5.17% animal glue, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-024A: Friction sensitive composition for use in matches:
Into a suitable mixing bowl, equipped with motorized stirrer, in the usual manner, place ***175 grams of standard animal glue***, and then followed by 500 milliliters of warm water. Thereafter, blend the mixture for about 45 minuets at 100 Celsius to form a uniform mixture. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, add in ***175 grams of zinc oxide***, followed by ***325 grams of ground glass powder***, followed by ***50 grams of gum benzoin***, followed by ***100 grams of red phosphorus***, followed by ***25 grams of flours of sulfur***, followed by ***75 grams of lead hypophosphite***, and then followed by ***500 grams of potassium chlorate***. Thereafter, blend the mixture for about 30 minutes at room temperature to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over and over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35.08% potassium chlorate, 22.8% glass powder, 12.28% animal glue, 12.28% zinc oxide, 7.01% red phosphorus, 5.26% lead hypophosphite, 3.5% gum benzoin, 1.75% sulfur, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-025A: Friction sensitive composition for use in matches:
Into a suitable beaker or similar container, place ***160 grams of animal glue***, and then add in 300 milliliters of water. Thereafter, boil the mixture to dissolve the glue. Thereafter, remove the heat source, and allow the mixture to cool to about 30 to 40 Celsius. Thereafter, add in 100 additional milliliters of water (warm water, pre-heated to about 40 Celsius), and then add in ***450 grams of potassium chlorate***, followed by ***210 grams of powdered glass***, followed by ***40 grams of plaster of Paris powder***, followed by ***40 grams of zinc oxide***, followed by ***20 grams of" whiting"***, followed by ***30 grams flours of sulfur***, and then finally followed by ***100 grams of red phosphorus***. Thereafter, blend the mixture at 30 to 40 Celsius for about 1 hour to form a uniform mass. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over an over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.85% potassium chlorate, 20% powdered glass, 15.23% animal glue, 9.52% red phosphorus, 3.8% plaster of Paris, 3.8% zinc oxide, 2.85% sulfur, 1.9% whiting, 0.05% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-026A: Classic match-head composition:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot, place ***25 grams of sulfur***, followed by ***75 grams of phosphorus sesqui-sulfide***, and then followed by ***200 grams of powdered sand***. Thereafter, tumble the mixture at 250 RPM for about

1 hour. Thereafter, or in the mean time, place 200 milliliters of water, and then add in ***175 grams of standard animal glue***, and then boil the mixture for abut 10 to 15 minutes to form a uniform dispersion. Thereafter, remove the heat source, and allow the glue mixture to cool to room temperature. Thereafter, add in the tumbled mixture of the phosphorus sesqui-sulfide, and then add in ***125 grams of potassium perchlorate***, and then blend the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over an over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.33% sand, 29.16% animal glue, 20.83% potassium perchlorate, 12.5% phosphorus sesqui-sulfide, 4.16% sulfur, 0.02% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-026B: Classic match-head composition:

Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot, place ***110 grams of powdered sand***, and then followed by ***30 grams of phosphorus sesqui-sulfide***. Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, or in the mean time, place 175 milliliters of water, and then add in ***85 grams of standard animal glue***, and then boil the mixture for abut 10 to 15 minutes to form a uniform dispersion. Thereafter, remove the heat source, and allow the glue mixture to cool to room temperature. Thereafter, add in the tumbled mixture of the phosphorus sesqui-sulfide, and then add in ***100 grams of ammonium perchlorate***, and then blend the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over an over again to form the match head of any desired thickness.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.84% powdered sand, 30.76% ammonium perchlorate, 26.15% animal glue, 9.23% phosphorus sesqui-sulfide, 0.02% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-027A: Classic "safety" match-head composition:

Into a suitable beaker or similar container, place ***160 grams of animal glue***, and then add in 400 milliliters of water. Thereafter, boil the mixture for about 15 minutes. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, attach a motorized stirrer, and then add in ***70 grams of powdered chalk***, followed by ***100 grams of finely divided magnesium/silicon alloy (50/50)***, followed by ***270 grams of powdered sand***, followed by ***100 grams of red phosphorus***, and then followed by ***300 grams of potassium perchlorate***. Thereafter, blend the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and re-dipped over an over again to form the match head of any desired thickness

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% potassium perchlorate, 27% powdered sand, 16% animal glue 10% magnesium/silicon alloy, 10% red phosphorus, 7% powdered chalk***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches.

05-02-028A: Match composition for multiple uses:

Preparation of composition 1:

Into a suitable beaker or similar container, place 77.5 grams of animal glue, and then add in 300 milliliters of water. Thereafter, heat the mixture to about 50 Celsius, and then blend the mixture for about 30 minutes. Thereafter, add in 21.25 grams of gluten, followed by 58.75 grams of finely pulverized red brick powder, followed by 212.5 grams of pulverized wood dust, followed by 43.25 grams of flours of sulfur, followed by 16.25 grams of powdered bituminous coal dust, followed by 4.4 grams of black antimony sulfide, followed by 18.75 grams of calcium hydroxide, followed by 42.5 grams of powdered coke, and then finally followed by 11 grams of pulverized soft wood charcoal. Thereafter, blend the mixture on high speed for about 1 hour. Thereafter, place the mixture aside for the moment.

Preparation of composition 2:

Into a suitable empty ball mill, or vertical mixer, place 120 grams of pulverized coke, followed by 22.5 grams o black antimony sulfide, followed by 102.5 grams of powdered glass, followed by 160 grams of powdered red brick dust, and then followed by 95 grams of potassium dichromate. Thereafter, add in about 100 milliliters of warm water, and then tumble or rotate the mixture at 200 RPM for about 1 hour. Thereafter, place composition 1, and composition 2 on separate shallow trays, and allow both compositions to thoroughly dry. Once they have both dried. Manually pulverize both compositions.

Preparation of final match composition:

Into a suitable mixing drum, equipped with motorized stirrer, place 580 milliliters of warm water, and then add in ***220 grams of potassium chlorate***, followed by ***140 grams of composition 1***, and then followed by ***30 grams of composition 2***. Thereafter, blend the mixture on high speed for about 2 hours. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, re-dipped, and dried, in the usual manner. To use the composition in electric matches, or ignition charges, the pasty mass needs to be placed onto a shallow tray or pan, and then allowed to thoroughly air-dry. Once it has, the mixture needs to be pulverized using a ball mill or any suitable means to form a uniform powder. Thereafter, the mixture needs to be pressed into tablets or pellets under high pressure in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***56.41% potassium chlorate, 35.89% composition 1, 7.69% composition 2, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make matches, and for use in making electric matches and ignition compositions.

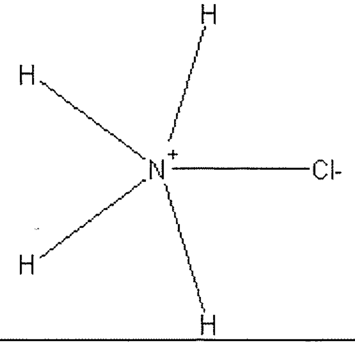
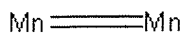
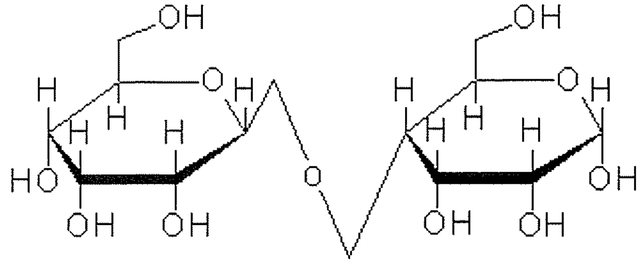
05-02-029A: Weatherproof match composition:

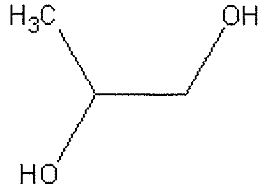
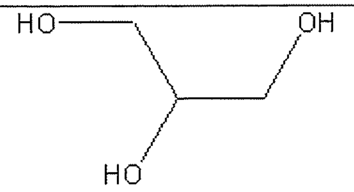
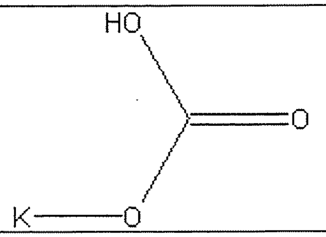
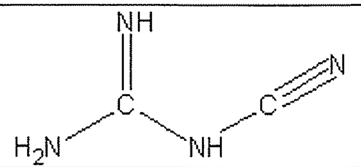
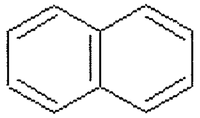
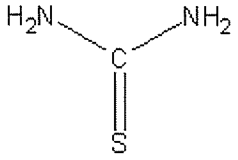
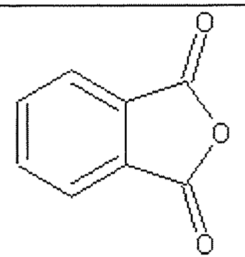
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***20 grams of standard animal glue***, and then add in ***100 grams of regular corn starch*** and then followed by 720 milliliters of warm water. Thereafter, blend the mixture on moderate speed for about 45 minutes. Afterwards, add in ***200 grams of powdered glass***, followed by ***480 grams of potassium chlorate***, followed by ***200 grams of powdered pumice stone***, followed by ***80 grams of antimony trisulfide***, followed by ***120 grams of sodium nitrate***, followed by ***40 grams of pulverized cascarilla bark***, and the finally followed by ***20 grams of lamp black***. Thereafter, blend the entire mixture at 60 Celsius for about 1 hour to form a uniform mass. Thereafter, the mixture is ready for use. To use, the match sticks simply need to be dipped, dried, re-dipped, dried, and then re-dipped and dried as many times thereafter as desired.

Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 6+ (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***38.09% potassium chlorate, 15.87% powdered glass, 15.87% powdered pumice stone, 9.52% sodium nitrate, 7.93% corn starch, 6.34% antimony trisulfide, 3.17% cascarilla bark, 1.58% animal glue, 1.58% lamp black, 0.05% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to make weatherproof matches.

Section 3: Smoke generating Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)	**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)	**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)	**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)	**110. Ammonium Chloride**
	
	Forms colorless crystals, or white granules or powder. The crystals sublime when heated, and hence cannot be melted. The crystals are soluble in water and alcohol, but insoluble in other common solvents. Ammonium chloride is easily prepared by dissolving ammonia into dilute hydrochloric acid, followed by recrytsallization.
111. Manganese	**112. Lactose**
	 OH H O H H H H HO OH OH O OH H O H H H H OH OH OH
Manganese forms brilliant steel gray crystals. The crystalline powder is stable at room temperature, but will slowly react with water. The powder is a strong reducing agent, and can reduce many different metal oxides. Manganese reacts with the halogens upon heating. Manganese burns with an intense light.	Forms a monohydrate, which is an alpha form. Is the typical milk sugar, and melts when rapidly heated to 202 Celsius. Lactose is stable at room temperature, but tends to absorb odors upon standing. The crystals are soluble in water, but relatively insoluble in other solvents.

113. Propylene Glycol	**114. Glycerol**
	
Forms a very hygroscopic viscous liquid. The melting point of the viscous liquid is –59 Celsius, with a boiling point of 188 Celsius at STP. The liquid is miscible with water, acetone, and chloroform, but less soluble in ether.	Forms a non-toxic syrupy viscous liquid. The liquid has a melting point of 17 Celsius, with a boiling point of 290 Celsius. The liquid is miscible with water and alcohol, but is relatively insoluble in common organic solvents. Glycerol is a major by-product in the soap manufacturing process, and is the least toxic of all known alcohols, including grain alcohol.
115. Potassium Chloride	**116. Potassium Bicarbonate**
K—Cl	
Forms white to colorless crystals, granules, or powder. The crystals have a melting point of 773 Celsius. The crystals are moderately soluble in water, but insoluble in alcohol and most common solvents.	Forms the usual colorless to white crystals, granules, or powder. The crystals are soluble in water, but insoluble in the usual solvents. It reacts vigorously with acids. Potassium bicarbonate is a common ingredient in baking powders.
117. Dicyanodiamide	**118. Naphthalene**
	
Forms monoclinic crystals with a melting point of 209 Celsius. The crystals are relatively insoluble in water, alcohol, and other common solvents. Can be prepared by polymerization of cyanamide.	Forms colorless to white granules, crystals, or powder forming monoclinic prismatic crystals. The crystals have a melting point of 80 Celsius. The crystals have the odor of mothballs, which are primarily naphthalene. The crystals tend to sublime when heated to higher temperatures. Naphthalene makes up about 11% of coal tar.
119. Thiourea	**120. Phthalic Anhydride**
	
Thiourea forms transparent crystals with a melting point of 178 Celsius. The crystals are not very soluble in water or other common solvents. Thiourea tends to form addition products with metal salts.	Forms colorless to white crystalline needles with a melting point of 131 Celsius, and a boiling point of 295 Celsius. The crystals tend to partially sublime upon heating. The anhydride breaks down when treated with water.
122. Cadmium powder	**123. Cadmium Sulfide**
Cd=Cd	Cd=S
Cadmium forms a silvery-white to silvery-bluish metal. The solid metal can easily be cut with a knife at room temperature. The solid metal has a melting point of 321 Celsius, but the powder readily forms an oxide when heated in air. The powder is usually colored gray due to some oxidation. Cadmium metal is a cancer suspect agent, so users should be careful.	Forms light yellow to orange cubic crystals. The crystals are relatively insoluble in water and most organic solvents. Decomposes when treated with acids.

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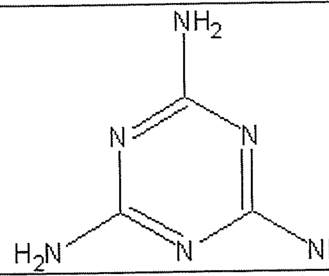
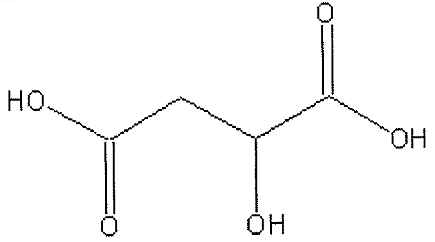
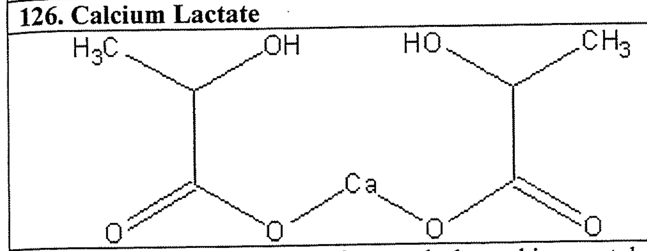
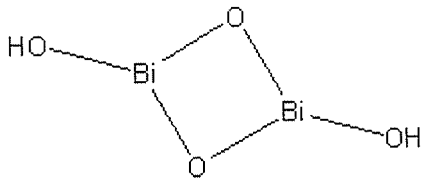
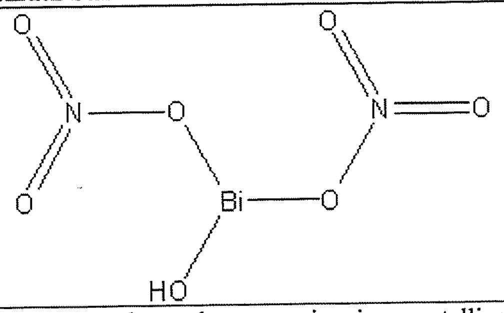
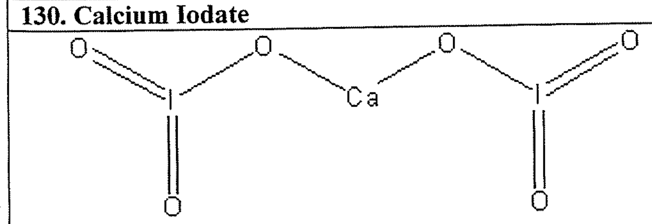
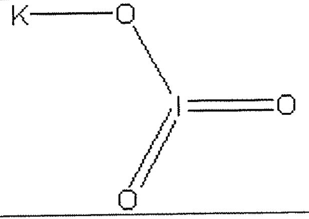
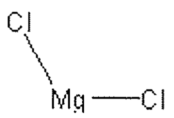
124. Melamine	**125. Malic Acid**
	
Forms slightly unstable monoclinic crystals with a melting point of 250 Celsius. The crystals tend to sublime at higher temperatures. Melamine is soluble in water, but insoluble in alcohol and most organic solvents. The solid tends to polymerize on standing or when treated with aldehydes.	Has three distinct enantiomers. The L form is the most common isomer, and forms colorless crystals with a melting point of 100 Celsius. The crystals tend to break down when heated to 140 Celsius. The compound is readily soluble in water, and soluble in many organic solvents. The L form is found in apple juice.
126. Calcium Lactate	**127. Metallic Sodium**
	Na—Na
Forms a pentahydrate, which forms odorless white crystals, granules, or powder. The crystals loose their water of hydration when heated to 120 Celsius. The product is soluble in water, but insoluble in alcohol and other solvents.	Sodium forms a silvery white metallic solid with a beautiful luster. The solid has a melting point of 98 Celsius, and boiling point of 881 Celsius. The solid is very reactive, and tarnishes rapidly when exposed to air. Sodium reacts violently with water and many other chemicals, so caution should be used.
128. Bismuth Tetraoxide	**129. Bismuth Subnitrate**
	
Forms an orange red to yellowish brown solid. The solid is slowly decomposed by water, but rapidly by acids.	The nitrate forms a heavy hygroscopic microcrystalline solid. The solid is insoluble in water and alcohol and other solvents, but the solid is soluble in acids. The solid decomposes when heated to red heat.
130. Calcium Iodate	**131. Potassium Iodate**
	
The iodate forms nonhygroscopic prismatic crystals, which are relatively insoluble in water and alcohol. The iodate forms a monohydrate and a hexahydrate.	Forms colorless to white crystals, granules, or powder. The melting point of the crystals is 560 Celsius, with decomposition starting at such temperature. The iodate is relatively insoluble in water and the usual organic solvents.
132. Magnesium Chloride	**133. Para-Nitroaniline**



Forms colorless to white crystals, granules, or powder The anhydrous form has a melting point of 712 Celsius. The anhydrous crystals dissolve in water with the evolution of heat, and the formation of a hexahydrate. Anhydrous magnesium chloride reacts with alcohols forming addition compounds.

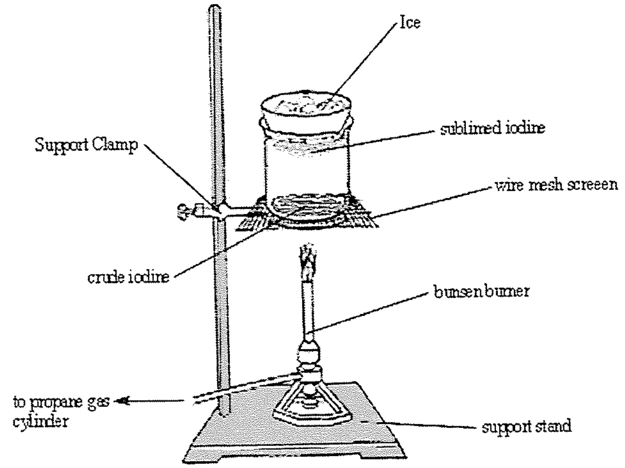
134. Iodine

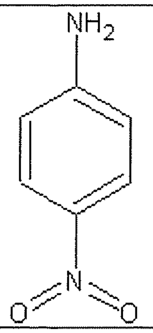
I———I

Iodine forms beautiful purple to purple black crystal, plates, or scales that have a brilliant metallic luster. The crystals have an irritating odor and tend to volatize forming a mild purple vapor at STP. The crystals have a melting point of 113 Celsius, and a boiling point of 185 Celsius; however, the crystals will volatize on gentle heating. Iodine is insoluble in water, but soluble in alkaline earth iodide solutions (tinctures), but soluble in chloroform, glacial acetic acid, and glycerol oils.

Method of Preparation 1: Into a beaker or other suitable container add 50 grams of potassium iodide or 45 grams of sodium iodide, followed by 150 milliliters of cold tap water. Thereafter, stir the entire mixture for several minutes to dissolve all solids. Thereafter, add in 500 milliliters of regular household bleach (Clorox bleach). Make sure the bleach is just regular household bleach and has no fancy addictives, colors, or the like. The rate of addition of the household bleach to the potassium or sodium iodide solution should be slow, but should only take about 15 to 30 minutes. During the addition of the household bleach to the potassium or sodium iodide solution, casually stir the potassium or sodium iodide solution. After the addition of the household bleach, continue to stir the mixture for about 30 minutes, and then do one of two things: A. filter the mixture to recover the brownish black precipitate formed (crude iodine) using either gravity filtration or vacuum filtration, or B. extract the mixture with methylene chloride (three 75-millilter portions). If filtering the reaction mixture, allow the brownish precipitate of iodine to collect on the filter paper, and thereafter, allow the filter paper to stand over night and partially dry, or if using vacuum filtration, vacuum dry the brownish precipitate. Thereafter, gently scrape-off the brownish precipitate from the filter paper, into a clean beaker or other suitable container, and then add in 500 milliliters of warm tap water. Then gently mix the iodine mixture for about 10 minutes, and then once again, filter-off the insoluble iodine using gravity filtration (this is called washing the iodine with water). Note: if using vacuum filtration, after vacuum drying the initial iodine after filtration, simply wash it several times with three 150-milliliter portions, of warm tap water, and then vacuum dry the iodine. If using gravity filtration, after washing the iodine, and then collecting the iodine by filtration, allow the filter paper containing the iodine to stand over night to partially dry. The next day, gently scrape-off the iodine from the filter paper onto a clean piece of glass or porcelain dish (no metal), and then set this dish aside (no sunlight) for several days to allow the iodine to dry. When the iodine has been dried, either by using vacuum filtration, or by using the slow process of air-drying, place the dry iodine into a sublimation apparatus, as illustrated below, and sublime the iodine to purify it. This sublimation process should be repeated once more to produce what is called "double sublimed reagent grade iodine", which will have a purity of no less then 98% iodine

If you extracted the reaction mixture with methylene chloride, combine all methylene chloride portions once finished (if not already done so), and then dry this combined methylene chloride portion by adding to it, 15 grams of anhydrous magnums sulfate. Then stir the entire mixture for about 10 minutes (to absorb moisture), and then filter-off the magnesium sulfate. Once the magnesium sulfate has been filtered-off, place this methylene chloride into a standard atmospheric distillation apparatus, and gently distill-off the methylene chloride at 40 Celsius until no more methylene chloride distills over. When this is the result, recycle the methylene chloride, and then recover the left over remaining brownish residue of iodine. Then place this recovered iodine into a sublimation apparatus, as illustrated below, and sublime the iodine to purify it. This sublimation process should be repeated once more to produce what is called "double sublimed reagent grade iodine", which will have a purity of no less then 98% iodine



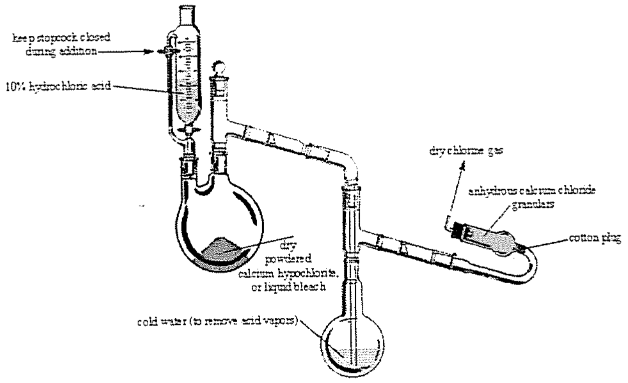


Forms a beautiful bright yellow powder with a melting point of 146 Celsius. The powder is insoluble in water and the usual solvents, but is soluble in benzene and methanol. Para nitro aniline is toxic, so users should avoid skin contact.

Method of Preparation 2: Into a suitable beaker or container, place 250 milliliters of warm tap water, followed by 70 grams of bleaching powder. Thereafter, stir the entire mixture for about 1 hour, and then filter-off the precipitated solids (composed of calcium hydroxide). Note: vacuum filtration works best, but if all you have is gravity filtration, place a small amount of clean sand in the bottom of the filter paper before filtering. This will help aid in the filtration process, which can be a slow one. After the filtration process, you will have a yellowish relatively odorless liquid. This yellow liquid will be composed of hypochlorous acid. Now, prepare a potassium or sodium iodide solution by adding and dissolving 50 grams of potassium iodide, or 45 grams of sodium iodide into 200 milliliters of tap water, and then slowly add this iodide solution to your yellowish hypochlorous acid mixture over a period of about 10 to 15 minutes. After 10 to 15 minutes, stir the mixture for about 30 minutes, and then filter-off the precipitated brownish solids (composed of the crude iodine). Once the brown solids have been filtered-off, wash them with several portions of cold water (use the same technique as in method 1 for washing), and then vacuum dry or air-dry these brownish solids. Thereafter, place this dried iodine into a sublimation apparatus, as illustrated in method 1, and then sublime the iodine to purify it. This sublimation process should be repeated once more to produce what is called "double sublimed reagent grade iodine", which will have a purity of no less then 98% iodine.

Method of Preparation 3: Now, into a suitable beaker, flask, or container, place 50 grams of potassium iodide or 45 grams of sodium iodide, followed by 150 milliliters of tap water. Thereafter, stir the entire mixture for about 30 minutes to dissolve all solids. Into a chlorine generator apparatus, as illustrated below, place into the reaction flask, 15 grams of manganese dioxide, or 240 grams of a 5% sodium hypochlorite solution (Clorox bleach), or 13 grams of potassium permanganate, or 19 grams of calcium hypochlorite, bleaching powder (65% available chlorine). Then place into the addition funnel, a hydrochloric acid solution prepared by adding and dissolving 30 grams of 35 to 38% hydrochloric acid (muriatic acid of 31% will work) into 40 milliliters of tap water. If you are using an electrochemical cell, fill your cell with 40 milliliters of concentrated hydrochloric acid, followed by 200 milliliters of cold tap water.

Once your chlorine generator is setup (if using the hydrochloric acid drip method), begin dripping the hydrochloric acid solution, onto the oxidizer contained in the reaction flask. If using an electrochemical cell, begin the electrolysis by plugging in your battery charger. In either case, the chlorine gas that is evolved should then be bubbled into your potassium or sodium iodide solution (previously prepared). The chlorine gas will react with the potassium or sodium iodide to form iodine, which will precipitate as a brownish-black solid. When no more chlorine gas passes over, in either case, the reaction is complete. Thereafter, filter-off the precipitated brownish-black iodine solids, as usual, using either vacuum filtration or gravity filtration, and then wash them with cold water, and then vacuum dry or air-dry the solids. Once the iodine is completely dry, sublime it as illustrated in method 1. Repeat the sublimation process one more time to yield high purity reagent grade iodine.


keep stopcock closed during addition
10% hydrochloric acid
dry chlorine gas
anhydrous calcium chloride granulars
cotton plug
dry powdered calcium hypochlorite, or liquid bleach
cold water (to remove acid vapors)

- Smoke Generating Compositions in this section -

1. 05-03-001A: White smoke generating composition 1: *38.6% Terephthalic acid, 23% potassium chlorate, 17.8% pentaerythritol, 10.4% sugar, 4.4% magnesium carbonate, 3.4% polymerized sucrose binder containing some water, 2% stearic acid, 0.40% moisture*	**2. 05-03-001B: Yellow smoke generating composition 1:** *41.6% yellow dye, 22.5% potassium chlorate, 20.4% magnesium carbonate, 11.4% sugar, 3.8% polymerized sucrose binder, 0.3% moisture*
3. 05-03-001C: Green smoke generating composition 1: *29.4% green dye, 24.5% potassium chlorate, 16.9% magnesium carbonate, 12.5% yellow dye, 12.3% sugar, 4.1% polymerized sucrose binder, 0.3% moisture*	**4. 05-03-002A: Yellow smoke generating composition 2** *35.6% yellow dye "organol", 21.3% potassium chlorate, 17.3% guanidine nitrate, 16.2% glycidyl ether 100 epoxy resin, 5% ethandiol plasticizer, 3% methyl carbazate binder, 1% ethanolamine hardener, 0.20% ferric oxide catalyst, 0.40% moisture*

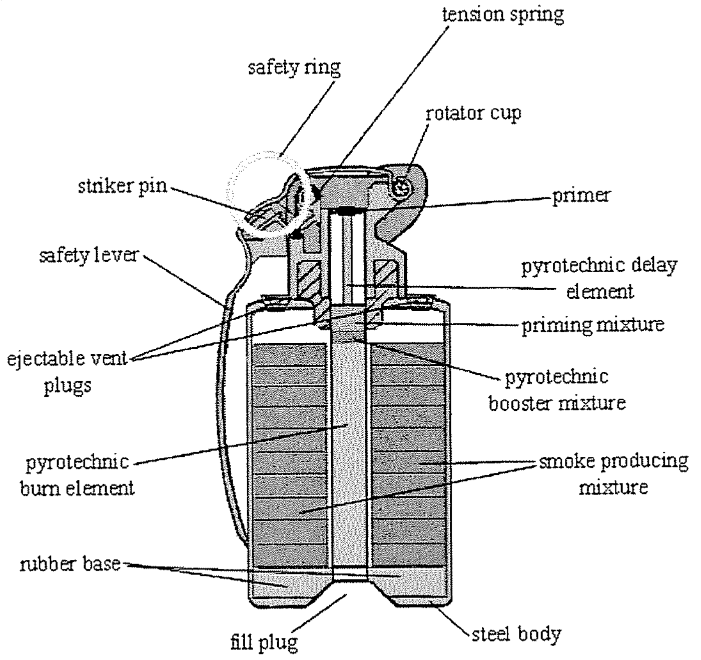
5. 05-03-002B: Red smoke generating composition 1: *37.9% red dye "organol", 23.9% guanidine nitrate, 14.9% glycidyl ether 100 epoxy resin, 13.9% potassium chlorate, 4.9% methyl carbazate, 3.9% propanediol plasticizer, 0.199% ferric oxide catalyst, 0.401% moisture*	**6. 05-03-003A: White smoke generating composition 2:** *31.2% zinc oxide, 30% ammonium perchlorate, 15% polychloroisoprene plasticizer, 14.2% ammonium chloride, 9.3 di-otyl-phthalate binder, 0.3% moisture*
7. 05-03-004A: White smoke generating composition 3: *38% red phosphorus, 30% manganese, 11% magnesium, 8.6% polyglycol resin, 5.3% epoxy resin, 4% lead dioxide, 3% zinc oxide, 0.10% residue*	**8. 05-03-005A: Red smoke generating composition 2:** *34.2% red dye No. 1, 17.5% sucrose, 16.5% potassium chlorate, 14.5% 1,4-benzenedicarboxylic acid, 10.5% magnesium carbonate, 6.8% red dye No. 11*
9. 05-03-006A: High yielding dense red smoke generating composition with long range view ability: *42.9% red dye No. 1, 28% lactose, 23.1% potassium chlorate, 5.9% red dye No 2*	**10. 05-03-007A: Dense green smoke generating composition with long range view ability:** *25% di(1,4,-amylamino anthraquinone, 25% quinoline yellow base, 20% lactose, 20% potassium chlorate, 10% diatomaceous earth*
11. 05-03-007B: Dense yellow smoke generating composition with long range view ability: *50% quinoline yellow base, 25% lactose, 25% potassium chlorate*	**12. 05-03-008A: Excellent yellow smoke generating composition with long duration:** *33% organol yellow dye, 21.5% potassium chlorate, 19.5% glycidil ether 100 epoxy resin, 16.5% guanidine nitrate, 7% propylene glycol, 2.5% ethanolamine hardener*
13. 05-03-008B: Excellent green smoke generating composition with long duration: *28% organol green thermoplastic dye, 18% guanidine nitrate, 17.6% glycidil ether 100 epoxy resin, 17% potassium chlorate, 8% organol yellow dye, 7% glycerol, 2.4% ethanolamine hardener, 0.8% manganese dioxide catalyst, 0.6% iron oxide catalyst, 0.3% copper oxide catalyst, 0.3% nickel oxide catalyst*	**14. 05-03-008C: Excellent red smoke generating composition with long duration:** *31.8% organol red J dye, 25% guanidine nitrate, 17.3% potassium chlorate, 17.2% glycidil ether 100 epoxy resin, 6.8% glycerol, 1.9% ethanolamine hardener*
15. 05-03-009A: Standard military white smoke generating composition: *51% red phosphorus, 35% pyrolusite, 8% magnesium, 3% zinc oxide, 3% epoxy binder*	**16. 05-03-010A: Military grade white smoke generating composition for camouflage purposes utilization the "wet mixing" process:** *50% red phosphorus, 44% calcium sulfate, 3% Viton A rubber binder, 3% boron*
17. 05-03-011A: Environmentally safe white smoke generating composition: *20% magnesium, 20% potassium nitrate, 15% potassium chloride, 15% sodium chloride, 12% potassium bicarbonate, 10% dicyandiamide, 8% potassium perchlorate*	**18. 05-03-012A: Opaque smoke generating composition for interfering with and blocking infrared targeting:** *71.4% hexachlorobenzene, 17.8% magnesium, 8.9% vinylidine polyfluoride binder, 1.7% naphthalene, 0.2% residue*
19. 05-03-012B: Opaque smoke generating composition for interfering with and blocking infrared targeting (modified): *41% hexachloroethane, 20% naphthalene, 13.3% vinylidine polyfluoride, 13.3% chlorinated paraffin, 12.3% magnesium, 0.1% residue*	**20. 05-03-013A: Improved "HC" white smoke composition (standard US military smoke composition):** *47.2% zinc oxide, 47.2% hexachloroethane, 5.5% aluminum, 0.1% residue*
21. 05-03-014A: Standard white smoke composition utilizing guanidine nitrate: *36% guanidine nitrate, 34% hexachloroethane, 22% zinc, 8% zinc oxide*	**22. 05-03-014B: Standard white smoke composition utilizing guanidine nitrate (modified):** *56% red phosphorus, 40% guanidine nitrate, 4% hexachloroethane*
23. 05-03-015A: Opaque smoke generating composition for interfering with infrared targeting systems (modified): *31% hexachloroethane, 31% zinc, 16% potassium perchlorate, 12% zinc oxide, 10% neoprene binder*	**24. 05-03-015B: Opaque smoke generating composition for interfering with infrared targeting systems (modified):** *66.6% hexachlorobenzene, 19% magnesium, 9.5% naphthalene, 4.7% neoprene binder, 0.20% residue*
25. 05-03-016A: Standard white smoke generating composition for general use: *36.3% ammonium perchlorate, 16.5% zinc oxide, 13.2% thiourea, 12% rubber binder, 11% PVC, 11% ammonium chloride*	**26. 05-03-017A: Standard blue smoke generating composition for general use:** *33.4% potassium nitrate, 25.1% amorphous boron, 12.6% magnesium, 11% wood charcoal, 9.4% Prussian blue dye, 8.4% chloroparaffin, 0.1% moisture*
27. 05-03-018A: White spotting smoke composition for artillery and mortar training and similar use: *40% zinc, 20% potassium nitrate, 20% aluminum, 20% potassium perchlorate*	**28. 05-03-019A: Orange smoke producing composition:** *42.9% potassium chlorate, 23.9% sucrose, 17.1% 1,8-diaminonapthalen coloring agent, 15.9% phthalic anhydride, 0.2% residue*
29. 05-03-019B: Orange smoke producing composition (modified): *39.9% potassium chlorate, 20.9% 1,8-diaminonapthalene, 19.4% phthalic anhydride, 13.9% glycerol, 5.9% polyethylene glycol*	**30. 05-03-019C: Orange smoke producing composition (modified 2):** *31% potassium chlorate, 17% 1,8-diaminonapthalene, 12% N-hexyl acid phthalate, 11% phthalic anhydride, 11% Epon 828 epoxy resin, 10% glycerol, 8% sodium barbiturate*

31. 05-03-019D: Yellow smoke producing composition: *44% potassium chlorate, 34% para-phenylene diamine dye, 22% sucrose*	**32. 05-03-019E: Violet smoke producing composition:** *33% potassium chlorate, 30% 1,8-diaminonapthalene dye, 30% pyromellitic dianhydride dye, 7% sucrose*
33. 05-03-019F: Violet smoke producing composition (modified): *31% potassium chlorate, 17% 1,8-diaminonapthalene dye, 12% N-hexyl acid phthalate, 11% Epon 828 epoxy resin, 11% phthalic anhydride, 10% glycerol, 8% sodium barbiturate*	**34. 05-03-019G: Red smoke producing composition:** *47.3% tetrabromo phthalic anhydride, 32.6% potassium chlorate, 15.9% 1,8-diaminonapthalene, 4.2% sucrose*
35. 05-03-019H: Green smoke producing composition: *49.7% para-dimethylaminobenzaldehyde dye, 32.4% potassium chlorate, 17.8% sucrose, 0.10% residue*	**36. 05-03-020A: Intensely red producing smoke composition for spotting and signaling:** *40% 1-methylaminoanthraquinone dye, 30% potassium chlorate, 12.9% aromatic disulfide ether, 10.1% benzyldimethylamine, 3.5% glycerine glycidyl ether, 3.5% poly sulfide*
37. 05-03-021A: Safe to use, flameless yellow-orange smoke composition for use in highly flammable environments: *43.2% ammonium iodate, 29.2% hydroxyl terminated polybutadiene binder, 20.7% leucoquinizarin, 6.6% hexamethylene diisocyanate curative agent, 0.121% dibutyl dilaurate curing catalyst, 0.179% residue*	**38. 05-03-022A: Smoke composition for use at night producing a brownish-black smoke, which looks orange from a distance:** *50% cadmium metal, 46% potassium nitrate, 3.9% epoxy resin, 0.10% residue*
39. 05-03-022B: Smoke composition for use at night producing a brownish-black smoke, which looks orange from a distance (modified): *46.6% black powder, 38.8% cadmium sulfide, 8.7% cadmium metal, 5.8% strontium nitrate, 0.10% mixed impurities*	**40. 05-03-023A: Non organic-chlorine containing white smoke composition for screening:** *49.2% potassium ferric chloride, 37.8% zinc oxide, 10.1% aluminum, 2.7% sodium nitrate, 0.20% moisture*
41. 05-03-024A: Non-toxic smoke generating composition for use in various training operations: *71.7% trans-cinnamic acid, 12.3% potassium chlorate, 5.2% sucrose, 4.9% cellulose nitrate, 3.8% sodium bicarbonate, 1.9% diatomite silica, 0.2% impurities*	**42. 05-03-025A: Pyrotechnic composition for producing a mixed smoke:** *44.19% sodium chlorate, 22.09% maltose, 13.25% melamine freebase, 9.94% malic acid, 7.18% calcium lactate, 2.76% manganese dioxide, 0.55% copper chromite burn rate catalyst, 0.04% impurities*
43. 05-03-026A: Red phosphorus smoke composition: *67.56% red phosphorus, 27.02% unleaded gasoline, 5.4% butylmethacrylate, 0.02% mixed balance*	**44. 05-03-026B: Red phosphorus smoke composition (modified component):** *40.76% red phosphorus, 21.73% sodium nitrate, 19.02% unleaded gasoline, 13.58% metallic sodium, 4.89% butylmethacrylate, 0.02% impurities*
45. 05-03-027A: Purple smoke composition: *33.33% ammonium iodide, 25% potassium chlorate, 20.83% iodine, 12.5% lactose, 8.33% magnesium, 0.01% mixed balance*	**46. 05-03-028A: Yellow smoke composition:** *66% potassium dichromate, 20% bismuth tetraoxide, 14% magnesium powder*
47. 05-03-028B: Yellow smoke composition: *65% potassium dichromate, 20% bismuth subnitrate, 15% magnesium powder*	**48. 05-03-029A: Brown smoke composition:** *50% copper-II-oxide, 35% lead dioxide, 15% magnesium powder*
49. 05-03-030A: Orange smoke composition: *50% lead dioxide, 35% potassium dichromate, 15% magnesium powder*	**50. 05-03-031A: Pink smoke composition:** *54% potassium iodate, 37% calcium silicide, 9% potassium chromate*
51. 05-03-031B: Pink smoke composition: *65% calcium iodate, 25% magnesium powder, 10% potassium chromate*	**52. 05-03-032A: Classic HC smoke composition:** *35.82% zinc oxide, 34.82% hexachloroethane, 16.91% ammonium perchlorate, 11.94% magnesium powder, 0.49% linseed oil or mineral oil, 0.02% residual balance*
53. 05-03-032B: Classic smoke composition modified with magnesium chloride: *29.85% ammonium perchlorate, 24.87% anhydrous magnesium chloride, 24.87% magnesium powder, 19.9% zinc oxide, 0.49% linseed or mineral oil, 0.02% mixed balance*	**54. 05-03-033A: Modified HC smoke composition for generating a hydroscopic smoke for use in humid environments:** *39.5% potassium perchlorate, 20.66% hexachloroethane, 20.5% aluminum powder, 19.34% lithium carbonate*
55. 05-03-034A: Simplified reddish smoke composition for bursting type munitions: *77.5% lead iodate, 22.5% aluminum powder*	**56. 05-03-034B: Simplified reddish-purple smoke composition for bursting type munitions:** *75% lead iodate, 25% zirconium hydride*
57. 05-03-035A: Dense reddish smoke composition: *40.9% para-nitroaniline, 22.72% potassium chlorate, 22.72% sublimed iodine, 13.63% lactose, 0.03% residual balance*	**58. 05-03-036A: Opaque smoke composition for marine use:** *40% sodium nitrate, 22.5% ammonium chloride, 20% antimony trisulfide, 12.5% sulfur, 5% coal pitch*
59. 05-03-036B: Opaque smoke composition for marine use: *30% sodium chlorate, 22.5% ammonium chloride, 20% red phosphorus, 12.5% powdered zinc, 10% manganese dioxide, 5% bituminous coal*	**60. 05-03-036C: Opaque smoke composition for marine use:** *38.46% sodium nitrate, 25.64% ammonium chloride, 20.51% antimony trisulfide, 12.82% sulfur, 2.56% coal pitch, 0.01% mixed balance*

61. 05-03-037A: Under-water launched green smoke composition for marine use: *34.44% solvent green dye, 25.24% potassium chlorate, 20.73% sugar, 6.85% vat yellow dye, 4.59% benzanthrone dye, 4.5% diatomaceous earth, 3.6% baking soda, 0.05% mixed residual balance*	**62. 05-03-037C: Under-water launched yellow smoke composition for marine use:** *27.47% benzanthrone dye, 21.92% potassium chlorate, 19.89% vat yellow dye No. 4, 14.03% powdered sugar, 9.64% diatomaceous earth, 7.01% baking soda, 0.04% mixed residual balance*

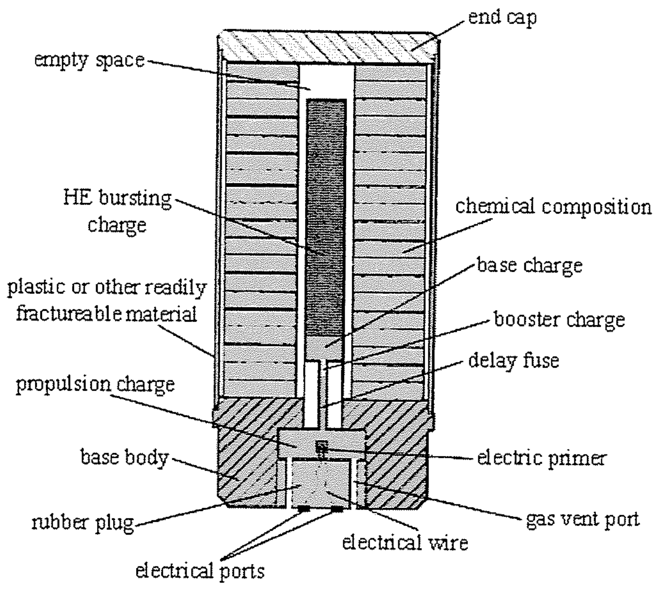
05-03-001A: White smoke generating composition 1:
Step 1: Preparation of special binder:
Into a suitable flask, place 10 grams of para-toluene sulfonic acid, followed by 15 milliliters of water, followed by 100 grams of table sugar. Thereafter, heat the mixture to 100 Celsius for about 3 hours under heavy agitation. A motorized stirrer should be used as the agitation source. After heating and stirring for about 3 hours, remove the heat source, and allow the reaction mixture to cool to room temperature. Thereafter, pour the cooled reaction mixture mass onto a shallow pan, and allow it to air-dry thoroughly until no trace of water exists. When all the water has been removed, take the remaining mass, and mix it thoroughly into 110 milliliters of water to form a uniform mixture—thereafter, filter the mixture to remove any insoluble materials (if any). After the mixture (the special binder) has been filtered (if needed), your ready to form the actual smoke composition.
Step 2: Preparation of smoke composition:
Into a standard ball mill, place ***52 grams of Terephthalic Acid***, followed by ***24 grams of pentaerythritol***, and then followed by 50 grams of Teflon coated steel shot of 5 millimeters in diameter. Then tumble the mixture at room temperature at 200 RPM for about 1 hour. After 1 hour, throw in ***6 grams of magnesium carbonate***, followed by ***2.7 grams of stearic acid***, followed by ***31 grams of potassium chlorate***, and then followed by ***14 grams of table sugar*** and then continue to tumble the mixture at room temperature at 200 RPM for about 30 minutes. After 30 minutes, throw in ***4.7 grams of the special binder mixture*** (prepared in step 1), and then continue tumble the mixture at room temperature, but reduce the rotation speed to about 50 RPM, and rotate at this temperature for about 10 to 15 minutes. Afterwards, place the thoroughly blended smoke mixture onto a shallow pan, and allow it to cure for 3 days. After about 3 days, place the cured material back into a clean ball mill, and mill the mixture for 2 hours at 180 RPM using 75 grams of Teflon coated steel shot of 10 millimeters in diameter. Thereafter, the mixture is ready for use. To use the mixture, it should be pressed under high pressure (3000+ psi) into any suitable delivery container, such as a grenade, plastic tube, cardboard tube, ceramic or clay ball, ect., ect. Note: you should a small igniter composition to begin the burn of this smoke composition.
Burn rate: About 42 seconds per 136 gram pressed sample at 3,000 psi—burn rate will vary based on pressing, i.e, granulated sample will burn faster then pressed sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***38.6% Terephthalic acid, 23% potassium chlorate, 17.8% pentaerythritol, 10.4% sugar, 4.4% magnesium carbonate, 3.4% polymerized sucrose binder containing some water, 2% stearic acid, 0.40% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations.

Classic smoke grenade



05-03-001B: Yellow smoke generating composition 1:
Step 1: Preparation of special binder:
Into a suitable flask, place 10 grams of para-toluene sulfonic acid, followed by 15 milliliters of water, followed by 100 grams of table sugar. Thereafter, heat the mixture to 100 Celsius for about 3 hours under heavy agitation. A motorized stirrer should be used as the agitation source. After heating and stirring for about 3 hours, remove the heat source, and allow the reaction mixture to cool to room temperature. Thereafter, pour the cooled reaction mixture mass onto a shallow pan, and allow it to air-dry thoroughly until no trace of water exists. When all the water has been removed, take the remaining mass, and mix it thoroughly into 110 milliliters of water to form a uniform mixture—thereafter, filter the mixture to remove any insoluble materials (if any). After the mixture (the special binder) has been filtered (if needed), your ready to form the actual smoke composition.
Step 2: Preparation of smoke composition:
Into a standard ball mill, place ***56.6 grams of yellow dye No. 33 or equivalent***, followed by ***27.8 grams of magnesium carbonate***, and then followed by 50 grams of Teflon coated steel shot of 5 millimeters in diameter. Then tumble the mixture at room temperature at 200 RPM for about 1 hour. After 1 hour, throw in ***30.6 grams of potassium chlorate***, and then followed by ***15.6 grams of table sugar*** and then continue to tumble the mixture at room temperature at 200 RPM for about 30 minutes. After 30 minutes, throw in ***5.2 grams of the special binder mixture*** (prepared in step 1), and then continue to tumble the mixture at room temperature, but reduce the rotation speed to about 50 RPM, and rotate at this temperature for about 10 to 15 minutes. Afterwards, place the thoroughly blended smoke mixture onto a shallow pan, and allow it to cure for 3 days. After about 3 days, place the cured material back into a clean ball mill, and mill the mixture for 2 hours at 180 RPM using 75 grams of Teflon coated steel shot of 10 millimeters in diameter. Thereafter, the mixture is ready for use. To use the mixture, it should be pressed under high pressure (3000+ psi) into any suitable delivery container, such as a grenade, plastic tube, cardboard tube, ceramic or clay ball, ect., ect. Note: you should use a small igniter composition to begin the burn of this smoke composition.
Burn rate: About 42 seconds per 136 gram pressed sample at 3,000 psi—burn rate will vary based on pressing, i.e, granulated sample will burn faster then pressed sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.6% yellow dye, 22.5% potassium chlorate, 20.4% magnesium carbonate, 11.4% sugar, 3.8% polymerized sucrose binder, 0.3% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations.

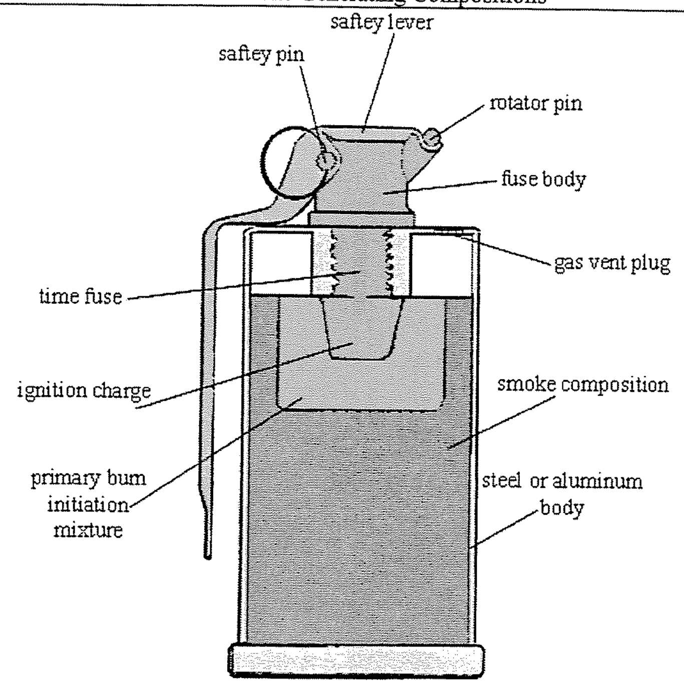
Bursting type, tube launched smoke grenade	**Description**



Bursting type smoke grenades are often found on vehicles and tanks. When they are initiated, they shoot a predetermined distance from the vehicle, where upon they explode, producing a cloud of smoke.

05-03-001C: Green smoke generating composition 1:
Step 1: Preparation of special binder:
Into a suitable flask, place 10 grams of para-toluene sulfonic acid, followed by 15 milliliters of water, followed by 100 grams of table sugar. Thereafter, heat the mixture to 100 Celsius for about 3 hours under heavy agitation. A motorized stirrer should be used as the agitation source. After heating and stirring for about 3 hours, remove the heat source, and allow the reaction mixture to cool to room temperature. Thereafter, pour the cooled reaction mixture mass onto a shallow pan, and allow it to air-dry thoroughly until no trace of water exists. When all the water has been removed, take the remaining mass, and mix it thoroughly into 110 milliliters of water to form a uniform mixture—thereafter, filter the mixture to remove any insoluble materials (if any). After the mixture (the special binder) has been filtered (if needed), your ready to form the actual smoke composition.
Step 2: Preparation of smoke composition:
Into a standard ball mill, place ***17 grams of yellow dye No. 33 or equivalent***, followed by ***40 grams of green dye No. 3 or equivalent***, followed by ***23 grams of magnesium carbonate***, and then followed by 50 grams of Teflon coated steel shot of 5 millimeters in diameter. Then tumble the mixture at room temperature at 200 RPM for about 1 hour. After 1 hour, throw in ***33.3 grams of potassium chlorate***, and then followed by ***16.7 grams of table sugar*** and then continue to tumble the mixture at room temperature at 200 RPM for about 30 minutes. After 30 minutes, throw in ***5.6 grams of the special binder mixture*** (prepared in step 1), and then continue to tumble the mixture at room temperature, but reduce the rotation speed to about 50 RPM, and rotate at this temperature for about 10 to 15 minutes. Afterwards, place the thoroughly blended smoke mixture onto a shallow pan, and allow it to cure for 3 days. After about 3 days, place the cured material back into a clean ball mill, and mill the mixture for 2 hours at 180 RPM using 75 grams of Teflon coated steel shot of 10 millimeters in diameter. Thereafter, the mixture is ready for use. To use the mixture, it should be pressed under high pressure (3000+ psi) into any suitable delivery container, such as a grenade, plastic tube, cardboard tube, ceramic or clay ball, ect., ect. Note: you should use a small igniter composition to begin the burn of this smoke composition.
Burn rate: About 42 seconds per 136 gram pressed sample at 3,000 psi—burn rate will vary based on pressing, i.e, granulated sample will burn faster then pressed sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***29.4% green dye, 24.5% potassium chlorate, 16.9% magnesium carbonate, 12.5% yellow dye, 12.3% sugar, 4.1% polymerized sucrose binder, 0.3% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations.

Classic Smoke Grenade



05-03-002A: Yellow smoke generating composition 2
Step 1: Preparation of the binder:
Into a suitable beaker, or container, place ***25 grams of ethanediol plasticizer,*** followed by ***15 grams of methyl carbazate,*** and then heat the mixture to about 60 Celsius with rapid stirring for about 30 minutes. After 30 minutes add in ***5 grams of ethanolamine***, and then continue to rapidly stir and heat the mixture at 60 Celsius for about 30 minutes. After 30 minutes, remove the heat source, and allow the mixture to cool to room temperature. After it does, mix in ***80 grams of glycidyl ether 100,*** and then rapidly stir the entire mixture at room temperature for about 1 hour. After 1 hour, the binder is ready to use. Note: this mixture should be continuously stirred at room temperature until use.
Step 2: Preparation of the smoke composition:
To prepare the smoke composition, place into a standard ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, ***1 gram of ferric oxide***, followed by ***175 grams of yellow "organol"dye***, and then tumble the mixture at 150 RMP at room temperature for about 30 minutes. After 30 minutes, add in ***85 grams of guanidine nitrate***, followed by ***105 grams of potassium chlorate***, and then continue to tumble the mixture at room temperature at 150 RPM for about 15 to 20 minutes. Thereafter, stop the ball mill, and place the mixture into a clean beaker or suitable container. Thereafter, add in the binder mixture prepared in step 1, and then rapidly blend the mixture on high using a motorized stirrer or equivalent for about 10 to 15 minutes. Thereafter, the mixture is ready for use. To use, it should be lightly pressed into any desirable container such as a grenade, shell, cardboard/plastic tube, ect., ect., and the resulting munition(s) should then be cured in an oven at 35 Celsius for about 12 hours. Note: you should a small igniter composition to begin the burn of this smoke composition. Note: the yellow "organol" dye can be replaced with SUDAN yellow dye.
Burn rate: Slow
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35.6% yellow dye "organol", 21.3% potassium chlorate, 17.3% guanidine nitrate, 16.2% glycidyl ether 100 epoxy resin, 5% ethandiol plasticizer, 3% methyl carbazate binder, 1% ethanolamine hardener, 0.20% ferric oxide catalyst, 0.40% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations.

05-03-002B: Red smoke generating composition 1:
Step 1: Preparation of the binder:
Into a suitable beaker, or container, place ***20 grams of propanediol plasticizer,*** followed by ***25 grams of methyl carbazate,*** and then heat the mixture to about 60 Celsius with rapid stirring for about 10 minutes. Afterwards, remove the heat source, and allow the mixture to cool to room temperature. After it does, mix in ***75 grams of glycidyl ether 100,*** and then rapidly stir the entire mixture at

room temperature for about 10 minutes. Afterwards, the binder is ready to use. Note: this mixture should be continuously stirred at room temperature until use.

Step 2: Preparation of the smoke composition:

To prepare the smoke composition, place into a standard ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, *1 gram of ferric oxide*, followed by *190 grams of red "organol" dye (methylaminoanthraquinone)*, and then tumble the mixture at 150 RMP at room temperature for about 10 to 20 minutes. Afterwards, add in *120 grams of guanidine nitrate*, followed by *70 grams of potassium chlorate*, and then continue to tumble the mixture at room temperature at 150 RPM for about 10 minutes. After 10 minutes, stop the ball mill, and place the mixture into a clean beaker or suitable container. Thereafter, add in the binder mixture prepared in step 1, and then rapidly blend the mixture on high using a motorized stirrer or equivalent for about 10 to 15 minutes. Afterwards, the mixture is ready for use. To use, it should be lightly pressed into any desirable container such as a grenade, shell, cardboard/plastic tube, ect., ect., and the resulting munition(s) should then be cured in an oven at 60 Celsius for about 12 hours. Note: you should a small igniter composition to begin the burn of this smoke composition.

Burn rate: Slow
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: *37.9% red dye "organol", 23.9% guanidine nitrate, 14.9% glycidyl ether 100 epoxy resin, 13.9% potassium chlorate, 4.9% methyl carbazate, 3.9% propanediol plasticizer, 0.199% ferric oxide catalyst, 0.401% moisture*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations.

05-03-003A: White smoke generating composition 2:

Place into a standard ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, *37.5 grams of di-octyl-phthalate*, followed by *125 grams of zinc oxide*, and then followed by *120 grams of ammonium perchlorate*, and then tumble the mixture at 200 RMP at room temperature for about 15 to 30 minutes. Afterwards, stop the mixing, and then place the contents in a clean beaker or suitable container. Thereafter, quickly add in *60 grams of polychloroisoprene*, and then rapidly blend the mixture using preferably a motorized stirrer on high for about 10 to 15 minutes to form a uniform mix. Afterwards, slowly add in, in small portions at a time, *57 grams of ammonium chloride* while rapidly stirring the mixture. After all the ammonium chloride has been removed, continue to rapidly blend the mixture at room temperature for about 10 to 15 minutes. After which, to use the smoke composition, it should be lightly pressed into any desirable container such as a grenade, shell, cardboard/plastic tube, ect., ect., and the resulting munition(s) should then be cured in an oven at 80 Celsius for about 2 hours, and then cured at room temperature for 24 hours thereafter. Note: you should use a small igniter composition to begin the burn of this smoke composition.

Burn rate: 0.70 millimeters per second (for smoke mixture 20 millimeters in diameter by 100 millimeters in length), after being pressed and cured.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: *31.2% zinc oxide, 30% ammonium perchlorate, 15% polychloroisoprene plasticizer, 14.2% ammonium chloride, 9.3 di-otyl-phthalate binder, 0.3% moisture*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations

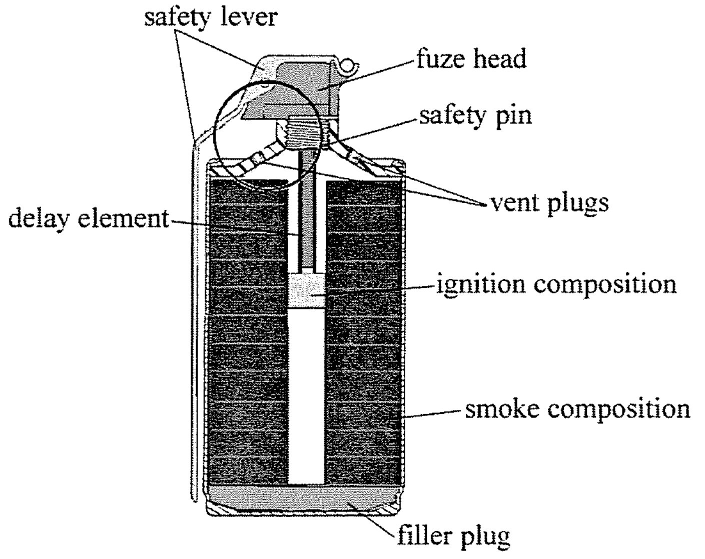
05-03-004A: White smoke generating composition 3:

Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, place *26.6 grams of Epoxy resin (D.E.R. 732)*, followed by *43 grams of polyglycol resin (QX-3812)*, and then followed by *15 grams of zinc oxide*, and then blend the mixture at moderate speed for about 15 to 30 minutes. Afterwards, throw in *55 grams of magnesium powder,* followed by *190 grams of red phosphorus,* and then continue to blend the mixture at moderate speed for about 15 to 30 minutes. Afterwards, add in *150 grams of manganese dioxide,* and the followed by *20 grams of lead dioxide,* and then continue to blend the mixture at moderate speed for about 15 to 20 minutes. Afterwards, the mixture is ready to be cast. To do so, place the semi-fluidized mixture into any desired container, tube (candle), or mold and then cure for several days. Note: curing the smoke munitions in an oven at 40 Celsius may speed up the process.

Burn rate: 185 seconds per 190-gram candle.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *38% red phosphorus, 30% manganese, 11% magnesium, 8.6% polyglycol resin, 5.3% epoxy resin, 4% lead dioxide, 3% zinc oxide, 0.10% residue*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations.

Standard smoke grenade



05-03-005A: Red smoke generating composition 2:

Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, place *171 grams of solvent red No. 1 dye*, followed by *34 grams of disperse red No. 11 dye*, followed by *87.5 grams of sucrose*, followed by *72.5 grams of 1,4,-benzenedicaroxylic acid,* followed by *52.5 grams of magnesium carbonate,* and then blend the mixture at moderate speed for about 10 to 15 minutes. Afterwards, add in *82.5 grams of potassium chlorate,* and then add in 2 liters of acetone, and then continue to blend the mixture at moderate speed until al the acetone evaporates. During the evaporation of the acetone, the mixture will take on a dough-like texture and will then form granules as the acetone completely evaporates. Once the acetone has evaporated, place the remaining granules onto a shallow pan, and cure them in an oven at 60 Celsius for several hours. Thereafter, the mixture is ready to be pressed. To do so, press the granules into any desirable container, tube (candle), or mold under high pressure of about 5000 psi. Thereafter, a starter composition should then be pressed in.

Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *34.2% red dye No. 1, 17.5% sucrose, 16.5% potassium chlorate, 14.5% 1,4-benzenedicarboxylic acid, 10.5% magnesium carbonate, 6.8% red dye No. 11*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in professional smoke munitions for determining gas leaks, spotting, signaling, and in military operations.

05-03-006A: High yielding dense red smoke generating composition with long-range view ability:

Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, place *65 grams of red dye No. 1*, followed by *9 grams of red dye No. 2* (Rhodamine B), followed by *42.5 grams of lactose*, followed by 50 milliliters of cold water, and then blend the mixture at moderate speed for about 30 minutes to form a paste. After 30 minutes, add in *35 grams of potassium chlorate,* and then continue to blend the mixture at moderate speed. Thereafter, the mixture is ready to be cured. To do so, simply allow it to air-dry on any tray or pan, and then press the dried mass into any desirable container, tube (candle), or mold under high pressure, of about 5000 psi. Thereafter, a starter composition should then be pressed in for proper ignition.

Burn rate: Very slow.
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.9% red dye No. 1, 28% lactose, 23.1% potassium chlorate, 5.9% red dye No 2***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military operations for spotting, signaling, and landing operations.

05-03-007A: Dense green smoke generating composition with long-range view ability:
Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, place ***25 grams of di(1,4-amylamino anthraquinone***, followed by ***25 grams of quinoline yellow base***, followed by ***20 grams of lactose***, and then followed by 50 milliliters of cold water, and then blend the mixture at moderate speed for about 30 minutes to form a paste. After 30 minutes, add in ***20 grams of potassium chlorate,*** followed by ***10 grams of diatomaceous earth,*** and then continue to blend the mixture at moderate speed. Thereafter, place the mixture onto a shallow pan or tray, and allow it to air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 100 grams of Teflon coated steel shot, and then tumble the mixture for about 15 to 30 minutes at 150 RPM. After the tumbling operation, press the mixture into any desirable container, tube (candle), or mold under high pressure, of about 20,000 psi. Thereafter, a starter composition should then be pressed in for proper ignition.
Burn rate: Very slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***25% di(1,4,-amylamino anthraquinone, 25% quinoline yellow base, 20% lactose, 20% potassium chlorate, 10% diatomaceous earth***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military operations for spotting, signaling, and landing operations.

05-03-007B: Dense yellow smoke generating composition with long-range view ability:
Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, place ***50 grams of quinoline yellow base,*** followed by ***25 grams of lactose***, followed by 50 milliliters of cold water, and then blend the mixture at moderate speed for about 30 minutes to form a paste. After 30 minutes, add in ***25 grams of potassium chlorate,*** and then continue to blend the mixture at moderate speed. Thereafter, place the mixture onto a shallow pan or tray, and allow it to air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 100 grams of Teflon coated steel shot, and then tumble the mixture for about 1 hour at 150 RPM. After the tumbling operation, press the mixture into any desirable container, tube (candle), or mold under high pressure, of about 20,000 psi. Thereafter, a starter composition should then be pressed in for proper ignition.
Burn rate: Very slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% quinoline yellow base, 25% lactose, 25% potassium chlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military operations for spotting, signaling, and landing operations.

05-03-008A: Excellent yellow smoke generating composition with long duration:
Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, place ***165 grams of Organol yellow A.D.E. dye*** (sold by Pechiney Ugine Kullman Inc.), followed by ***82.5 grams of guanidine nitrate***, followed by ***107.5 grams of potassium chlorate***, and then followed by 150 milliliters of 95% ethyl alcohol, and then blend the mixture at moderate speed for about 30 minutes to form a paste. After 30 minutes, place the pasty mass onto a sheet or tray and allow the mass to air dry. Once it has, briefly break up the mass into pulverized pieces using a spoon or similar entity, and then place the dried mass into a clean mixing bowl or equivalent, equipped with motorized stirrer with plastic stir blade, and then add in ***35 grams of propylene glycol***, followed by ***97.5 grams of Glycidil ether 100*** (sold by Shell as an epoxyaliphatic resin), and then blend the mixture on high speed for about 5 to 10 minutes. Immediately thereafter, add in ***12.5 grams of ethanolamine*** (sold as Hardener HY 938 and aliphatic ethanolamine), and then continue to rapidly blend the mixture on high for about 5 to 10 minutes. Afterwards, the mixture is ready to be cast. To do so, it simply needs to be poured, pressed, and vibrated into any desirable bomb casing, grenade, container, tube, ect., and then allowed to cure for several days or so. A starter composition should then be pressed in for proper ignition.

Burn rate: 240 seconds per 500-gram sample
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33% organol yellow dye, 21.5% potassium chlorate, 19.5% glycidyl ether 100 epoxy resin, 16.5% guanidine nitrate, 7% propylene glycol, 2.5% ethanolamine hardener***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military operations for spotting, screening, concealing, signaling, and landing operations. Can also be used commercially to determine gas leaks and the like.

05-03-008B: Excellent green smoke generating composition with long duration:
Into a standard ball mill filled with 50 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***3 grams of red iron-III-oxide***, followed by ***4 grams of manganese dioxide***, followed by ***1.5 grams of copper-II-oxide***, and then followed by ***1.5 grams of nickel oxide***, and then tumble the mixture for about 30 minutes at 200+ RPM. Thereafter, place this tumble mixture into standard mixing bowl or blender equipped with plastic motorized stirrer, followed by ***140 grams of Organol green thermoplast dye*** (sold by Pechiney Ugine Kullman Inc.), followed by ***90 grams of guanidine nitrate***, followed by ***40 grams of Organol yellow A.D.E. dye*** (sold by Pechiney Ugine Kullman Inc.), followed by ***85 grams of potassium chlorate***, and then followed by 150 milliliters of 95% ethyl alcohol, and then blend the mixture at moderate speed for about 30 minutes to form a paste. After 30 minutes, place the pasty mass onto a sheet or tray and allow the mass to air dry. Once it has, briefly break up the mass into pulverized pieces using a spoon or similar entity, and then place the dried mass into a clean mixing bowl or equivalent, equipped with motorized stirrer with plastic stir blade, and then add in ***35 grams of glycerol***, followed by ***88 grams of Glycidyl ether 100*** (sold by Shell as an epoxy aliphatic resin), and then blend the mixture on high speed for about 5 to 10 minutes. Immediately thereafter, add in ***12 grams of ethanolamine*** (sold as Hardener HY 938 and aliphatic ethanolamine), and then continue to rapidly blend the mixture on high for about 5 to 10 minutes. Afterwards, the mixture is ready to be cast. To do so, it simply needs to be poured, pressed, and vibrated into any desirable bomb casing, grenade, container, tube, ect., and then allowed to cure for several days or so. A starter composition should then be pressed in for proper ignition, or utilize a proper smoke initiating fuze.
Burn rate: 300 seconds per 670-gram sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***28% organol green thermoplast dye, 18% guanidine nitrate, 17.6% glycidyl ether 100 epoxy resin, 17% potassium chlorate, 8% organol yellow dye, 7% glycerol, 2.4% ethanolamine hardener, 0.8% manganese dioxide catalyst, 0.6% iron oxide catalyst, 0.3% copper oxide catalyst, 0.3% nickel oxide catalyst***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military operations for spotting, screening, concealing, signaling, and landing operations. Can also be used commercially to determine gas leaks and the like.

05-03-008C: Excellent red smoke generating composition with long duration:
Into a standard mixing bowl or blender equipped with plastic motorized stirrer, place ***159 grams of Organol red J dye*** (sold by Pechiney Ugine Kullman Inc.), followed by ***125 grams of guanidine nitrate***, followed by ***86.5 grams of potassium chlorate***, and then followed by 150 milliliters of 95% ethyl alcohol, and then blend the mixture at moderate speed for about 30 minutes to form a paste. After 30 minutes, place the pasty mass onto a sheet or tray and allow the mass to air dry. Once it has, briefly break up the mass into pulverized pieces using a spoon or similar entity, and then place the dried mass into a clean mixing bowl or equivalent, equipped with motorized stirrer with plastic stir blade, and then add in ***34 grams of glycerol***, followed by ***86 grams of Glycidyl ether 100*** (sold by Shell as an epoxy aliphatic resin), and then blend the mixture on high speed for about 5 to 10 minutes. Immediately thereafter, add in ***9.5 grams of ethanolamine*** (sold as Hardener HY 938 and aliphatic ethanolamine), and then continue to rapidly blend the mixture on high for about 5 to 10 minutes. Afterwards, the mixture is ready to be cast. To do so, it simply needs to be poured, pressed, and vibrated into any desirable bomb casing, grenade, container, tube, ect., and then allowed to cure for several days or so. A starter composition should then be pressed in for proper ignition, or utilize a proper smoke initiating fuze.
Burn rate: 240 seconds per 700-gram sample.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***31.8% organol red J dye, 25% guanidine nitrate, 17.3% potassium chlorate, 17.2% glycidyl ether 100 epoxy resin, 6.8% glycerol, 1.9% ethanolamine hardener***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military operations for spotting, screening, concealing, signaling, and landing operations. Can also be used commercially to determine gas leaks and the like.

05-03-009A: Standard military white smoke generating composition:

Into a standard mixing bowl or blender equipped with plastic motorized stirrer, place ***255 grams of red amorphous phosphorus***, followed by ***40 grams of standard powdered magnesium***, followed by ***15 grams of zinc oxide***, followed by ***175 grams of finely powdered pyrolusite*** (natural occurring manganese dioxide ore), and then followed by 150 milliliters of 95% ethyl alcohol, and then blend the mixture at moderate speed for about 30 minutes to form a paste. After 30 minutes, place the pasty mass onto a sheet or tray and allow the mass to air dry. Once it has, briefly break up the mass into pulverized pieces using a spoon or similar entity, and then place the dried mass into a clean ball mill filled with about 150 grams of Teflon coated steel shot of any desired diameter, and then add in ***15 grams of any desirable epoxy binder***, and then tumble the mixture at about 150 RPM for about 10 to 15 minutes to form a uniform mixture. Thereafter, simply press the tumbled mixture into any desirable bomb casing, grenade, container, tube, ect., and then allow it to cure for several days or so. Mild heating in an oven may speed up the process. A starter composition should then be pressed in for proper ignition, or utilize a proper smoke initiating fuze.
Burn rate: 240 seconds per 700-gram sample
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***51% red phosphorus, 35% pyrolusite, 8% magnesium, 3% zinc oxide, 3% epoxy binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used by various militaries for multiple operations.

05-03-010A: Military grade white smoke generating composition for camouflage purposes utilizing the "wet mixing" process:

Into a standard mixing bowl or blender equipped with plastic motorized stirrer, place 50 milliliters of acetone, followed by ***15 grams of Viton A fluorocarbon rubber*** available from E. I. Dupont de Nemours Company, and then stir the mixture to dissolve the Viton A. Thereafter, add in ***250 grams of red phosphorus***, followed by ***15 grams of finely divided boron***, followed by ***220 grams of calcium sulfate***, and then blend the mixture at moderate speed for about 10 to 15 minutes. Thereafter, slowly add in, 40 to 50 milliliters of hexane (exact amount may vary), until the bulk of the Viton A precipitates. Once the Viton A has precipitated, the main ingredients of the mixture will be properly wet mixed forming polymer coated ingredients. Thereafter, simply filter-off the insoluble mixture using gravity filtration or preferably vacuum filtration, and then place the filtered-off mixture onto a shallow pan, and allow it to thoroughly air-dry. Finally, simply press the dried mixture into any desirable grenade body, bomb casing, container, mold, fish paper tube, candle, ect., under average pressure, followed by a proper ignition composition.
Burn rate: 2.7 millimeters/per second with 300 gram candle with dimensions of 12.7 centimeters long by 4.4 centimeters in diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% red phosphorus, 44% calcium sulfate, 3% Viton A rubber binder, 3% boron***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in concealing/camouflage operations.

05-03-011A: Environmentally safe white smoke generating composition:

Into a standard ball mill, filled with 150 grams of Teflon coated steel shot of average diameter, place ***100 grams of standard magnesium powder***, followed by ***60 grams of potassium bicarbonate***, followed by ***75 grams of potassium chloride***, followed by ***75 grams of sodium chloride***, and then tumble the mixture at about 150 RPM for about 5 to 10 minutes. Thereafter, add in ***50 grams of dicyandiamide***, followed by ***100 grams of potassium nitrate***, and then followed by ***40 grams potassium perchlorate***, and then continue to tumble the mixture at about 150 RPM for 15 to 30 minutes. Afterwards, the mixture is ready to go. To use, it simply needs to be pressed into any desirable grenade body, bomb casing, container, mold, fish paper tube, candle, ect., under average pressure, followed by a proper ignition composition.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***20% magnesium, 20% potassium nitrate, 15% potassium chloride, 15% sodium chloride, 12% potassium bicarbonate, 10% dicyandiamide, 8% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used by the military (for smoke screening), or in civil operations where sensitivity towards the environment needs to be addressed.

05-03-012A: Opaque smoke generating composition for interfering with and blocking infrared targeting:

First, place ***100 grams of standard magnesium powder*** into a beaker or suitable container, and then place this container with the metal powder into an oven and heat at 50 Celsius for about 24 hours. Thereafter, into a standard mixing bowl or blender equipped with plastic motorized stirrer, place 175 milliliters of 95% ethyl alcohol, followed by ***50 grams of vinylidine polyfluoride binder*** followed by ***400 grams of hexachlorobenzene***, followed by ***10 grams of naphthalene***, and then blend the mixture at moderate speed for about 10 to 15 minutes to form a paste. Thereafter, add in the magnesium powder (before it cools), and then continue to blend the mixture for about 10 minutes on moderate speed at room temperature. Thereafter, place the entire mixture onto a shallow pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a suitable ball mill filled with Teflon coated steel shot of the usual weight and size, and then ball mill the mixture for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use so simply press the mixture into any desirable container, flare body, mold, fish paper tube, candle, ect., under high pressure, (5000 psi) followed by pressing in a proper ignition composition.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***71.4% hexachlorobenzene, 17.8% magnesium, 8.9% vinylidine polyfluoride binder, 1.7% naphthalene, 0.2% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in masking vehicles and tanks from infrared-guided weapons.

05-03-012B: Opaque smoke generating composition for interfering with and blocking infrared targeting (modified):

First, place ***92.5 grams of standard magnesium powder*** into a beaker or suitable container, and then place this container with the metal powder into an oven at heat at 50 Celsius for about 24 hours. Thereafter, into a standard mixing bowl or blender equipped with plastic motorized stirrer, place 175 milliliters of 95% ethyl alcohol, followed by ***100 grams of vinylidine polyfluoride binder*** followed by ***307.5 grams of hexachloroethane***, followed by ***150 grams of naphthalene***, followed by ***100 grams of chlorinated paraffin***, and then blend the mixture at moderate speed for about 10 to 15 minutes to form a paste. Thereafter, add in the magnesium powder (before it cools), and then continue to blend the mixture for about 10 minutes on moderate speed at room temperature. Thereafter, place the entire mixture onto a shallow pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a suitable ball mill filled with Teflon coated steel shot of the usual weight and size, and then ball mill the mixture for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use so simply press the mixture into any desirable container, flare body, mold, fish paper tube, candle, ect., under high pressure, (5000 psi) followed by pressing in a proper ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41% hexachloroethane, 20% naphthalene, 13.3% vinylidine polyfluoride, 13.3% chlorinated paraffin, 12.3% magnesium, 0.1% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in masking vehicles and tanks from infrared-guided weapons.

05-03-013A: Improved "HC" white smoke composition (standard US military smoke composition):
Into a suitable beaker or similar container, equipped with motorized stirrer equipped with plastic stir blade, place 175 milliliters of diethyl ether, hexane, or acetone, and then add in ***236 grams of freshly calcined zinc oxide*** (can be prepared by roasting finely divided zinc oxide at 900 Celsius for several hours), followed by ***27.5 grams of standard powdered aluminum***, followed by ***236 grams of hexachloroethane***, and then blend the mixture on high until the bulk of the solvent evaporates. Once this point has been reached, place the slightly pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a ball mill filled with Teflon coated steel shot of the usual diameter, and then tumble the mixture for about 1 hour to form a uniform mixture. Thereafter, the powder can be pressed into any desirable "smoke pot", container, candle, ect., under a pressure of about 3000 psi. Thereafter a strong smoke igniter composition should then be pressed there into.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47.2% zinc oxide, 47.2% hexachloroethane, 5.5% aluminum, 0.1% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in many different military operations.

05-03-014A: Standard white smoke composition utilizing guanidine nitrate:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***110 grams of standard powdered zinc***, followed by ***40 grams of zinc oxide***, and then tumble the mixture for about 30 minutes at 200 RPM or so. Thereafter, add in ***170 grams of hexachloroethane***, followed by ***180 grams of guanidine nitrate***, and then continue to tumble the mixture at about 200 RPM for about 1 hour to form a uniform mixture. Afterwards, the mixture is ready for use. To use, it simply needs to be pressed into any desirable body, container, smoke pot, candle, ect., under a pressure of 3000 to 5000 psi. Requires good smoke composition ignition composition.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¼
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***36% guanidine nitrate, 34% hexachloroethane, 22% zinc, 8% zinc oxide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in many different military operations.

05-03-014B: Standard white smoke composition utilizing guanidine nitrate (modified):
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***280 grams of red phosphorus***, followed by ***20 grams of hexachloroethane***, and then tumble the mixture for about 30 minutes at 150 RPM or so. Thereafter, add in ***200 grams of guanidine nitrate***, and then continue to tumble the mixture at about 150 RPM for about 1 hour to form a uniform mixture. Afterwards, the mixture is ready for use. To use, it simply needs to be pressed into any desirable body, container, smoke pot, candle, ect., under a pressure of 3000 to 5000 psi. Requires good smoke composition ignition composition.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***56% red phosphorus, 40% guanidine nitrate, 4% hexachloroethane***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in many different military and commercial operations, and may be used in fireworks.

05-03-015A: Opaque smoke generating composition for interfering with infrared targeting systems (modified):
Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, 75 milliliters of 95% ethyl alcohol, followed by ***50 grams of neoprene binder,*** followed by ***155 grams of hexachloroethane***, followed by ***60 grams of zinc oxide***, followed by ***155 grams of standard zinc powder***, and then blend the mixture at moderate speed for about 10 to 15 minutes to form a paste. Thereafter, add in ***80 grams of potassium perchlorate,*** followed by 75 milliliters of diethyl ether, and then blend the mixture on high speed until the bulk of the ether evaporates. When this point is reached, continue to blend the mixture for about 5 minutes, and then place the entire pasty mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a suitable ball mill filled with Teflon coated steel shot of the usual weight and size, and then ball mill the mixture for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use so simply press the mixture into any desirable container, flare body, mold, fish paper tube, candle, ect., under high pressure (5000 psi), followed by pressing in a proper ignition composition.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***31% hexachloroethane, 31% zinc, 16% potassium perchlorate, 12% zinc oxide, 10% neoprene binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in masking vehicles and tanks from infrared-guided weapons.

05-03-015B: Opaque smoke generating composition for interfering with infrared targeting systems (modified):
Place into a standard mixing bowl or blender equipped with plastic motorized stirrer, 75 milliliters of 95% ethyl alcohol, followed by ***25 grams of neoprene binder,*** followed by ***350 grams of hexachlorobenzene***, followed by ***50 grams of naphthalene,*** and then blend the mixture at moderate speed for about 10 to 15 minutes to form a paste. Thereafter, add in the ***100 grams of standard magnesium powder,*** followed by 75 milliliters of diethyl ether, and then blend the mixture on high speed until the bulk of the ether evaporates. When this point is reached, place the entire pasty mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a suitable ball mill filled with Teflon coated steel shot of the usual weight and size, and then ball mill the mixture for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use so simply press the mixture into any desirable container, flare body, mold, fish paper tube, candle, ect., under high pressure (5000 psi), followed by pressing in a proper ignition composition.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.6% hexachlorobenzene, 19% magnesium, 9.5% naphthalene, 4.7% neoprene binder, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in masking vehicles and tanks from infrared-guided weapons.

05-03-016A: Standard white smoke generating composition for general use:
Into a suitable mixing bowl, blender, ect., equipped with suitable motorized stirrer utilizing a plastic stir blade such as a Teflon blade, place ***240 grams of any standard viscous binder such as natural rubber***, followed by 350 milliliters of hexane, and then stir the mixture to dissolve the viscous binder. Thereafter, prepare a dry mixture by placing into a suitable ball mill, filled with 150 grams or so of Teflon coated steel shot, ***220 grams of finely divided PVC*** of 150 to 250 mesh, followed by ***330 grams of calcined zinc oxide***, followed by ***220 grams of ammonium chloride***, and then followed by ***264 grams of thiourea***, and then tumble the mixture at 100 RPM for about 1 hour or so. Thereafter, add this dried tumbled mixture to the hexane/binder solution, and then blend the mixture for about 15 minutes at room temperature to form a paste. Afterwards, add in 150 milliliters of additional hexane, followed by ***726 grams of ammonium perchlorate*** of 150 to 250 mesh, and then continue to blend the mixture for about 30 minutes at room temperature. Thereafter, spread the pasty mass out on a shallow tray and allow it to thoroughly air-dry. Once the mass has thoroughly dried, it needs to be pulverized by placing it into a standard ball mill, filled with Teflon coated steel shot of the usual amount and diameter, and then tumbled at 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready to be pressed into any suitable container under a pressure of about 1500 psi. A proper ignition composition should then be pressed there into.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¼
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***36.3% ammonium perchlorate, 16.5% zinc oxide, 13.2% thiourea, 12% rubber binder, 11% PVC, 11% ammonium chloride***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used for general purposes, and in fireworks.

05-03-017A: Standard blue smoke generating composition for general use:

Into a suitable mixing bowl, blender, ect., equipped with suitable motorized stirrer utilizing a plastic stir blade such as a Teflon blade, place ***80 grams of chloroparaffin***, followed by 200 milliliters methylene chloride, and then stir the mixture to dissolve the chloroparaffin. Thereafter, prepare a dry mixture by placing into a suitable ball mill, filled with 150 grams or so of Teflon coated steel shot, ***120 grams of standard magnesium powder***, followed by ***90 grams of Prussian blue dye***, and then tumble the mixture at 100 RPM for about 15 minutes on moderate speed at room temperature. Thereafter, add this dried mixture to the chloroparaffin/methylene chloride solution, and then blend the mixture on moderate speed for about 10 minutes. After 10 minutes, add in ***239 grams of amorphous elemental boron***, and then continue to blend the mixture for another 10 minutes on moderate speed. Thereafter, add in ***318 grams of potassium nitrate,*** followed by ***105 grams of finely divided wood charcoal***, and then add in 300 milliliters of additional methylene chloride, and then continue to blend the mixture for about 30 minutes at room temperature to form a paste. Thereafter, spread the pasty mass out on a shallow tray and allow it to thoroughly air-dry. Once the mass has thoroughly dried, it needs to be pulverized by placing it into a standard ball mill, filled with Teflon coated steel shot of the usual amount and diameter, and then tumbled at 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready to be pressed into any suitable container under a pressure of about 2000 psi. A proper ignition composition should then be pressed there into.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.4% potassium nitrate, 25.1% amorphous boron, 12.6% magnesium, 11% wood charcoal, 9.4% Prussian blue dye, 8.4% chloroparaffin, 0.1% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for general purposes, and in fireworks.

05-03-018A: White spotting smoke composition for artillery and mortar training and similar use:

Into a standard ball mill, filled with Teflon coated steel shot of the usual weight and diameter, place ***200 grams of standard mesh zinc dust***, followed by ***100 grams of potassium nitrate***, followed by ***100 grams of standard atomized aluminum powder***, and then tumble the mixture at about 100 RPM for about 30 minutes. After 30 minutes, add in ***100 grams of potassium perchlorate***, and then continue to tumble the mixture for another 30 minutes at 100 RPM. Afterwards, the mixture is ready to be used. To do so, it simply needs to be pressed into any desirable container under high pressure (5000 psi). A suitable igniter composition should be pressed there into in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% zinc, 20% potassium nitrate, 20% aluminum, 20% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in spotting for artillery and mortar practice—the smoke can be clearly seen from 4 kilometers.

05-03-019A: Orange smoke producing composition:

Into a suitable mixing bowl, beaker, or similar container, place ***85.5 grams of 1,8-diaminonapthalene***, followed by ***79.5 grams phthalic anhydride***, followed by ***119.5 grams of sucrose***, and then followed by ***214 grams of potassium chlorate***. Thereafter, manually blend the mixture by hand using a plastic spatula or similar utensil for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 500 psi or more. Can be ignited readily using a match, or similar composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.

Percentage: ***42.9% potassium chlorate, 23.9% sucrose, 17.1% 1,8-diaminonapthalene coloring agent, 15.9% phthalic anhydride, 0.2% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in any suitable operation.

05-03-019B: Orange smoke producing composition (modified):

Into a suitable mixing bowl, beaker, or similar container, equipped with a motorized stirrer utilizing a plastic stir blade, place ***104.5 grams of 1,8-diaminonapthalene***, followed by ***97 grams phthalic anhydride***, followed by ***69.5 grams of glycerol***, followed by ***29.5 grams of polyethylene glycol*** (molecular weight of at least 400), and then followed by ***199.5 grams of potassium chlorate***. Thereafter, moderately blend the mixture for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready for use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 150 to 500 psi or more, and then cure the devices in an oven at 60 Celsius for about 72 hours. Can be ignited readily using a match, or similar composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.9% potassium chlorate, 20.9% 1,8-diaminonapthalene, 19.4% phthalic anhydride, 13.9% glycerol, 5.9% polyethylene glycol***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in any suitable operation.

05-03-019C:Orange smoke producing composition (modified 2):

Into a suitable mixing bowl, beaker, or similar container, equipped with a motorized stirrer utilizing a plastic stir blade, place ***85 grams of 1,8-diaminonapthalene***, followed by ***55 grams phthalic anhydride***, followed by ***50 grams of glycerol***, followed by ***55 grams of Epon 828 epoxy resin***, followed by ***40 grams of sodium barbiturate***, followed by ***60 grams of N-hexyl acid phthalate***, and finally followed by ***155 grams of potassium chlorate***. Thereafter, moderately blend the mixture for about 15 to 20 minutes to form a uniform mixture. After the mixing process, the mixture is ready for use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 150 to 500 psi or more, and then cure in oven at 60 Celsius for about 72 hours. Can be ignited readily using a match, or similar composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***31% potassium chlorate, 17% 1,8-diaminonapthalene, 12% N-hexyl acid phthalate, 11% phthalic anhydride, 11% Epon 828 epoxy resin, 10% glycerol, 8% sodium barbiturate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in any suitable operation.

05-03-019D: Yellow smoke producing composition:

Into a suitable mixing bowl, beaker, or similar container, place ***170 grams of para-phenylene diamine dye***, followed by ***110 grams of finely powdered sucrose***, and then followed by ***220 grams of potassium chlorate***. Thereafter, manually blend the mixture by hand using a plastic spatula or similar utensil for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready for use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 2000 psi or more. Can be ignited readily using a match, or similar composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44% potassium chlorate, 34% para-phenylene diamine dye, 22% sucrose***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used in any suitable operation.

05-03-019E: Violet smoke producing composition:
Into a suitable mixing bowl, beaker, or similar container, place ***150 grams of 1,8-diaminonapthalene***, followed by ***35 grams of finely powdered sucrose***, followed by ***150 grams of pyromellitic dianhydride***, and then followed by ***165 grams of potassium chlorate***. Thereafter, manually blend the mixture by hand using a plastic spatula or similar utensil for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready for use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 2000 psi or more. Can be ignited readily using a match, or similar composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33% potassium chlorate, 30% 1,8-diaminonapthalene dye, 30% pyromellitic dianhydride dye, 7% sucrose***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in any suitable operation.

05-03-019F: Violet smoke producing composition (modified):
Into a suitable mixing bowl, beaker, or similar container, equipped with a motorized stirrer utilizing a plastic stir blade, place ***85 grams of 1,8-diaminonapthalene***, followed by ***55 grams phthalic anhydride***, followed by ***50 grams of glycerol***, followed by ***55 grams of Epon 828 epoxy resin***, followed by ***60 grams of N-hexyl acid phthalate***, followed by ***40 grams of sodium barbiturate***, and then followed by ***155 grams of potassium chlorate***. Thereafter, moderately blend the mixture for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready to use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 150 to 500 psi or more, and then cure the devices in an oven at 60 Celsius for about 72 hours. Can be ignited readily using a match, or similar composition, but should be initiated using a copper oxide/lead dioxide mixture.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***31% potassium chlorate, 17% 1,8-diaminonapthalene dye, 12% N-hexyl acid phthalate, 11% Epon 828 epoxy resin, 11% phthalic anhydride, 10% glycerol, 8% sodium barbiturate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in any suitable operation.

05-03-019G: Red smoke producing composition:
Into a suitable mixing bowl, beaker, or similar container, place ***79.5 grams of 1,8-diaminonapthalene***, followed by ***21 grams of finel powdered sucrose***, followed by ***236.5 grams of tetrabromo phthalic anhydride***, and then followed by ***163 grams of potassium chlorate***. Thereafter, manually blend the mixture by hand using a plastic spatula or similar utensil for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready for use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 2000 psi or more. Can be ignited readily using a match, or similar composition
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47.3% tetrabromo phthalic anhydride, 32.6% potassium chlorate, 15.9% 1,8-diaminonapthalene, 4.2% sucrose***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in any suitable operation.

05-03-019H: Green smoke producing composition:

Into a suitable mixing bowl, beaker, or similar container, place ***250 grams of para-dimethylaminobenzaldehyde***, followed by ***89.5 grams of finely powdered sucrose***, and then followed by ***163 grams of potassium chlorate***. Thereafter, manually blend the mixture by hand using a plastic spatula or similar utensil for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready for use. To use, it simply needs to be pressed into any desirable container body, tube, ect., ect., under a pressure of about 2000 psi or more. Can be ignited readily using a match, or similar composition
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.7% para-dimethylaminobenzaldehyde dye, 32.4% potassium chlorate, 17.8% sucrose, 0.10% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in any suitable operation.

05-03-020A: Intensely red producing smoke composition for spotting and signaling:
Into a typical mixing bowl, blender, or similar device, equipped with motorized stirrer utilizing a plastic stir blade, place ***64.5 grams of an aromatic disulfide diglycidyl ether***, followed by ***17.5 grams of glycerine glycidyl ether***, followed by ***17.5 grams of a poly sulfide*** sold as a Thiokol liquid polymer sold as LP-3, and then followed by ***50.5 grams of benzyldimethylamine*** and then blend the mixture on high speed for about 5 to 10 minutes to form a homogenous mixture. Thereafter, add in ***150 grams of potassium chlorate***, followed by ***200 grams 1-methylaminoanthraquinone***, and then continue to blend the mixture at high speed for about 5 to 10 minutes to form a uniform mixture. Thereafter, the mixture is ready to be casted. To do so, it simply needs to be poured and vibrated into any desirable container, cardboard tube, plastic tube, metal tube, ect., ect., and then cure in an oven at 70 Celsius for about 1 hour. Requires standard ignition composition.
Burn rate: Average
Water resistance: Moderate.
Flame temperature: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% 1-methylaminoanthraquinone dye, 30% potassium chlorate, 12.9% aromatic disulfide ether, 10.1% benzyldimethylamine, 3.5% glycerine glycidyl ether, 3.5% poly sulfide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate red smoke for various operations.

05-03-021A: Safe to use, flameless yellow-orange smoke composition for use in highly flammable environments:
Into a standard ball mill, filled with steel shot of the usual diameter and weight, place ***110 grams of hexamethylene diisocyanate curative*** (commercially available as Desmodur N-100), followed by ***480 grams of a hydroxyl terminated polybutadiene binder*** (HTPB), followed by ***710 grams of ammonium iodate***, and then tumble the mixture for about 30 minutes at 150 RPM to from a uniform mix. Thereafter, place the entire mixture into a suitable mixing bowl, blender, mixer, ect., equipped with the usual motorized stirrer or equivalent and utilizing plastic stir blades, and then add in ***340 grams of leucoquinizarin***, sold under the chemical name, 1,4,9,10-tetrahydroxyanthracene, and then immediately thereafter, add in ***2 grams of dibutyltin dilaurate curing catalyst***, and then blend the mixture on high speed for about 10 to 15 minutes. After 10 to 15 minutes, press the mixture into any desirable grenade body, smoke pot, container, tube, ect., and then allow the mixture to cure overnight at room temperature. Requires proper ignition composition.
Burn rate: Average.
Water resistance: Moderate.
Flame temperature: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.2% ammonium iodate, 29.2% hydroxyl terminated polybutadiene binder, 20.7% leucoquinizarin, 6.6% examethylene diisocyanate curative agent, 0.121% dibutyl dilaurate curing catalyst, 0.179% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used to generate yellow-orange smoke for spotting, tracking, signaling, and other applications in environments that contain flammable materials such as brush, trees, flammable objects, ect.

05-03-022A: Smoke composition for use at night producing a brownish-black smoke, which looks orange from a distance:
Into a standard mixing bowl, blender, or similar container equipped with a motorized stirrer in the usual means, place ***255 grams of cadmium metal powder*** of average mesh, followed by ***235 grams of potassium nitrate***, and then followed by 100 milliliters of ether or hexane, and then blend the mixture until the bulk of the solvent evaporates. Thereafter, add in ***20 grams of any desirable epoxy resin such as epoxy resin 815*** or equivalent, and then quickly blend the mixture for about 5 to 10 minutes. Thereafter, cast the mixture into any desirable container, grenade, smoke pot, tube, ect., and then allow the munition to cure for a day or more. Requires a standard ignition composition.
Burn rate: Average.
Water resistance: Moderate.
Flame temperature: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% cadmium metal, 46% potassium nitrate, 3.9% epoxy resin, 0.10% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate a brownish-black smoke that looks orange from a distance when used near sun-set or in the late evening. The actual use of such a composition may vary, but may be used to produce visual distortions for concealment and other applications.

05-03-022B: Smoke composition for use at night producing a brownish-black smoke, which looks orange from a distance (modified):
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter, place ***200 grams of cadmium sulfide powder*** of average mesh, followed by ***45 grams of cadmium metal powder,*** followed by ***240 grams of black powder***, followed by ***30 grams of strontium nitrate***, and then tumble the mixture on 100 RPM for about 30 to 40 minutes. Thereafter, the mixture is ready to be used. To do so, it needs to be dead pressed into any desirable container, grenade, smoke pot, tube, ect., under a pressure of 5,000 psi. Requires a standard ignition composition.
Burn rate: Average.
Water resistance: Moderate.
Flame temperature: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.6% black powder, 38.8% cadmium sulfide, 8.7% cadmium metal, 5.8% strontium nitrate, 0.10% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate a brownish-black smoke that looks orange from a distance when used near sun-set or in the late evening. The actual use of such a composition may vary, but may be used to produce visual distortions for concealment and other applications.

05-03-023A: Non organic-chlorine containing white smoke composition for screening:
First, into a clean beaker, crucible, or similar heat resistant container, place ***81 grams of potassium chloride***, followed by ***217 grams of hydrated ferric chloride*** (FeCl3-6H2O), and then heat the mixture at 200 Celsius for several hours until the mixed product becomes water free. Note: the exact heating time may vary, but is concluded when no more moisture is evolved. You can check for this by placing a piece of glass over the heated mixture. If the glass fogs up, the reaction is not complete. Once the water has been removed, place the remaining heated product (containing a potassium ferric chloride complex), after it has cooled, into a ball mill, filled with 150 grams of Teflon coated steel shot of any desirable diameter, and then add in ***40 grams of finely powdered aluminum*** of standard mesh, followed by ***150 grams of finely divided zinc oxide***, and then followed by ***11 grams of sodium nitrate*** and then tumble the mixture at 100 RPM for about 2 hours. After 2 hours, the tumbled mixture is ready to be pressed. To do so, it simply needs to be pressed into any desirable grenade body, smoke pot, container, tube, ec, under a pressure of about 10000 psi in the usual manner. Thereafter, a proper, yet average ignition composition should be placed there into for proper ignition.
Burn rate: Average.
Water resistance: Moderate.
Flame temperature: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+

Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.2% potassium ferric chloride, 37.8% zinc oxide, 10.1% aluminum, 2.7% sodium nitrate, 0.20% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for generating white smoke for screening operations.

05-03-024A: Non-toxic smoke generating composition for use in various training operations:
Into a suitable mixing drum or ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter, place ***377.5 grams of trans-cinnamic acid***, followed ***27.5 grams of sucrose***, followed by ***65 grams of potassium chlorate***, followed by ***20 grams of sodium bicarbonate***, and then followed by ***10 grams of diatomite silica***. Thereafter, tumble the mixture at 100 to 200 RPM for about 1 hour to form a uniform powder. Thereafter, place the dry tumbled mixture into a suitable mixing drum or blender, equipped with stirrer in the usual fashion, and then add in a solvent mixture prepared by adding and dissolving ***26 grams of cellulose nitrate*** into 150 milliliters of acetone, and then blend the mixture until the bulk of the solvent evaporates and a stiff mass is obtained. Thereafter, the stiff mass should be pressed into any desirable tube, container, ect., in the usual manner, and then allow the munitions to cure. Using low heat in an oven may or may not be used to speed up the curing process. Note: the mixing process of the acetone/cellulose nitrate may be difficult as the addition of the acetone/cellulose nitrate solution causes the overall ingredients to form a stiff, rather un-wet mass. Should be ignited using a suitable ignition mixture.
Burn rate: Average.
Water resistance: Moderate.
Flame temperature: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***71.7% trans-cinnamic acid, 12.3% potassium chlorate, 5.2% sucrose, 4.9% cellulose nitrate, 3.8% sodium bicarbonate, 1.9% diatomite silica, 0.2% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for generating white smoke for various operations.

05-03-025A: Pyrotechnic composition for producing a mixed smoke:
Into a suitable mixing bowl, equipped with motorized stirrer, place 125 milliliters of 99% isopropyl alcohol, and then add in ***200 grams of dry maltose powder***, followed by ***65 grams of calcium lactate***, followed by ***90 grams of malic acid***, followed by ***25 grams of manganese dioxide***, and then blend the mixture for about 10 minutes. Thereafter, add in 25 milliliters of ether, and then add in ***120 grams of melamine freebase***, followed by ***5 grams of copper chromite***, and then followed by ***400 grams of sodium chlorate***, and then continue to blend the mixture for another 10 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Thereafter, place the mixture into a ball mill, filled with 150 grams of Teflon coated steel shot, and then tumble the mixture for about 30 minutes to form a uniform powder. Finally, to use the mixture, simply press it into any desirable grenade body, tube, casing, ball, ect., under a pressure of about 10,000 psi. A suitable ignition composition should be pressed in there to form a proper ignition.
Burn rate: Slow.
Water resistance: Good.
Stability: Can be stored for many years
Flammability (1 to 10): 4 to 4 ¾
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44.19% sodium chlorate, 22.09% maltose, 13.25% melamine freebase, 9.94% malic acid, 7.18% calcium lactate, 2.76% manganese dioxide, 0.55% copper chromite burn rate catalyst, 0.04% impurities***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating an unbalanced mixed smoke for spotting, patrolling, and signaling.

05-03-026A: Red phosphorus smoke composition:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***60 grams of butylmethacrylate***, followed by ***300 grams of unleaded premium gasoline***, and then followed by ***750 grams of red phosphorus***. Thereafter, blend the mixture on moderate speed in the absence of air for about 45 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any grenade body, or bomb casing. A burster charge must be inserted into the center of the munition for proper distribution of the incendiary agent.
Burn rate: Slower then napalm.
Water resistance: Good.
Stability: Can be stored for many years

Flammability (1 to 10): 4
Ease of ignition (1 to 10): 9+ (based on bursting charge).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***67.56% red phosphorus, 27.02% unleaded gasoline, 5.4% butylmethacrylate, 0.02% mixed balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating an unbalanced mixed smoke for spotting, patrolling, and signaling.

05-03-026B: Red phosphorus smoke composition (modified component):
Into a suitable mixing bowl, equipped with motorized stirrer, place ***90 grams of butylmethacrylate***, followed by ***350 grams of unleaded premium gasoline***, followed by ***400 grams of sodium nitrate***, followed by ***250 grams of metallic sodium***, and then followed by ***750 grams of red phosphorus***. Thereafter, blend the mixture on moderate speed in the absence of air for about 45 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any grenade body, or bomb casing. A burster charge must be inserted into the center of the munition for proper distribution of the incendiary agent.
Burn rate: Above moderate.
Water resistance: Moderate—keep out of contact of water.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 9+ (based on bursting charge).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.76% red phosphorus, 21.73% sodium nitrate, 19.02% unleaded gasoline, 13.58% metallic sodium, 4.89% butylmethacrylate, 0.02% impurities***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating an unbalanced mixed smoke for spotting, patrolling, and signaling.

05-03-027A: Purple smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***300 grams of potassium chlorate***, followed by ***100 grams of magnesium powder***, followed by ***250 grams of iodine***, followed by ***400 grams of ammonium iodide***, and then followed by ***150 grams of lactose***. Thereafter, tumble or rotate the mixture at 200 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.33% ammonium iodide, 25% potassium chlorate, 20.83% iodine, 12.5% lactose, 8.33% magnesium, 0.01% mixed balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating a purple smoke for various operations. Note: This composition may produce an irritating vapor, limiting its use.

05-03-028A: Yellow smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***330 grams of potassium dichromate***, followed by ***100 grams of bismuth tetraoxide***, and then followed by ***70 grams of magnesium powder***. Thereafter, tumble or rotate the mixture at 175 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66% potassium dichromate, 20% bismuth tetraoxide, 14% magnesium powder***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating a yellow smoke for various operations.

05-03-028B: Yellow smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***325 grams of potassium dichromate***, followed by ***100 grams of bismuth subnitrate***, and then followed by ***75 grams of magnesium powder***. Thereafter, tumble or rotate the mixture at 175 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***65% potassium dichromate, 20% bismuth subnitrate, 15% magnesium powder***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating a yellow smoke for various operations.

05-03-029A: Brown smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***250 grams of copper-II-oxide***, followed by ***175 grams of lead dioxide***, and then followed by ***75 grams of magnesium powder***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% copper-II-oxide, 35% lead dioxide, 15% magnesium powder***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating a brown smoke for various operations.

05-03-030A: Orange smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***250 grams of lead dioxide***, followed by ***175 grams of potassium dichromate***, and then followed by ***75 grams of magnesium powder***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% lead dioxide, 35% potassium dichromate, 15% magnesium powder***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating an orange smoke for various operations.

05-03-031A: Pink smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***185 grams of calcium silicide***, followed by ***270 grams of potassium iodate***, and then followed by ***45 grams of potassium chromate***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.

Percentage: ***54% potassium iodate, 37% calcium silicide, 9% potassium chromate***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating a pink smoke for various operations.

05-03-031B: Pink smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***325 grams of calcium iodate***, followed by ***50 grams of potassium chromate***, and then followed by ***125 grams of magnesium powder***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***65% calcium iodate, 25% magnesium powder, 10% potassium chromate***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating a pink smoke for various operations.

05-03-032A: Classic HC smoke composition:
Into a suitable ball mill, or empty vertical mixer, place ***120 grams of magnesium powder of average mesh***, and then followed by ***5 grams of linseed oil or mineral oil***. Thereafter, tumble or rotate the mixture at 75 RPM for about 10 minutes to coat the magnesium. Thereafter, add in ***360 grams of zinc oxide***, followed by ***350 grams of hexachloroethane***, and then followed by ***170 grams of ammonium perchlorate***. Thereafter, tumble or rotate the mixture at 350 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35.82% zinc oxide, 34.82% hexachloroethane, 16.91% ammonium perchlorate, 11.94% magnesium powder, 0.49% linseed oil or mineral oil, 0.02% residual balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating white smoke for screening and spotting.

05-03-032B: Classic smoke composition modified with magnesium chloride:
Into a suitable ball mill, or empty vertical mixer, place ***250 grams of magnesium powder of average mesh***, and then followed by ***5 grams of linseed oil or mineral oil***. Thereafter, tumble or rotate the mixture at 75 RPM for about 10 minutes to coat the magnesium. Thereafter, add in ***250 grams of anhydrous magnesium chloride***, followed by ***200 grams of zinc oxide***, and then followed by ***300 grams of ammonium perchlorate***. Thereafter, tumble or rotate the mixture at 350 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, bomb casing, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***29.85% ammonium perchlorate, 24.87% anhydrous magnesium chloride, 24.87% magnesium powder, 19.9% zinc oxide, 0.49% linseed or mineral oil, 0.02% mixed balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating white smoke for screening and spotting.

05-03-033A: Modified HC smoke composition for generating a hydroscopic smoke for use in humid environments:

Into a suitable ball mill, or empty vertical mixer, place ***96.7 grams of lithium carbonate***, followed by ***197.5 grams of potassium perchlorate***, followed by ***102.5 grams of aluminum powder***, and then followed by ***103.3 grams of hexachloroethane***. Thereafter, tumble or rotate the mixture at 300 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable grenade body, tube, mold, container, ect, under high pressure in the usual manner.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.5% potassium perchlorate, 20.66% hexachloroethane, 20.5% aluminum powder, 19.34% lithium carbonate***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used for generating white smoke with increased output in humid environments.

05-03-034A: Simplified reddish smoke composition for bursting type munitions:
Into a suitable ball mill, or empty vertical mixer, place ***387.5 grams of lead iodate***, and then followed by ***112.5 grams of aluminum powder***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, and then add in 100 milliliters of acetone. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable mold, container, ect., under high pressure in the usual manner. Note: a bursting charge is placed in the center of the smoke charge, and upon detonation of the bursting charge, a large cloud of smoke will be instantaneously produced.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***77.5% lead iodate, 22.5% aluminum powder***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used in smoke charges for producing an instantaneous cloud of smoke.

05-03-034B: Simplified reddish-purple smoke composition for bursting type munitions:
Into a suitable ball mill, or empty vertical mixer, place ***375 grams of lead iodate***, and then followed by ***125 grams of zirconium hydride***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, and then add in 100 milliliters of acetone. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable mold, container, ect., under high pressure in the usual manner. Note: a bursting charge is placed in the center of the smoke charge, and upon detonation of the bursting charge, a large cloud of smoke will be instantaneously produced.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% lead iodate, 25% zirconium hydride***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used in smoke charges for producing an instantaneous cloud of smoke.

05-03-035A: Dense reddish smoke composition:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***150 grams of potassium chlorate***, followed by ***90 grams of powdered lactose***, followed by ***150 grams of sublimed iodine***, and then followed by ***270 grams of para-nitroaniline***. Thereafter, add in 50 milliliters of acetone, followed by 50 milliliters of warm water, and then blend the mixture on moderate speed for about 45 minutes to form a uniform mass. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired flare body, tube, container, smoke pot, ect, and then dried in an oven, or under vacuum until dry and hard.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.

Flammability (1 to 10): 4
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.9% para-nitroaniline, 22.72% potassium chlorate, 22.72% sublimed iodine, 13.63% lactose, 0.03% residual balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used to generate a reddish smoke for the usual purposes.

05-03-036A: Opaque smoke composition for marine use:
Into a suitable ball mill, or vertical mixer, place ***100 grams of hard coal pitch (pre-pulverized)***, followed by ***400 grams of antimony trisulfide***, followed by ***250 grams of sulfur***, followed by ***800 grams of sodium nitrate***, and then followed by ***450 grams of ammonium chloride***. Thereafter, tumble or rotate the mixture at 300 RPM for about 2 hours. Thereafter, place the tumbled or rotated mixture into any suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of 95% ethyl alcohol and then followed by 150 milliliters of cold water. Thereafter, blend the mixture on moderate speed for about 45 minutes to form a uniform mass. Thereafter, the mixture is ready for use. To use, place the mixture into any desired press, and press-out the liquid. Thereafter, the pressed mixture simply needs to be pressed into any desired flare body, tube, container, smoke pot, ect, and then dried in an oven, or under vacuum until dry and hard in the usual manner.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% sodium nitrate, 22.5% ammonium chloride, 20% antimony trisulfide, 12.5% sulfur, 5% coal pitch***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used to generate large volumes of smoke for marine time use, or any other desired means.

05-03-036B: Opaque smoke composition for marine use:
Into a suitable ball mill, or vertical mixer, place ***100 grams of pulverized bituminous coal***, followed by ***400 grams of red phosphorus***, followed by ***250 grams of powdered zinc***, followed by ***200 grams of manganese dioxide***, followed by ***600 grams of sodium chlorate***, and then followed by ***450 grams of ammonium chloride***. Thereafter, tumble or rotate the mixture at 300 RPM for about 2 hours. Thereafter, place the tumbled or rotated mixture into any suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of 95% ethyl alcohol and then followed by 150 milliliters of cold water. Thereafter, blend the mixture on moderate speed for about 45 minutes to form a uniform mass. Thereafter, the mixture is ready for use. To use, place the mixture into any desired press, and press-out the liquid. Thereafter, the pressed mixture simply needs to be pressed into any desired flare body, tube, container, smoke pot, ect, and then dried in an oven, or under vacuum until dry and hard in the usual manner.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% sodium chlorate, 22.5% ammonium chloride, 20% red phosphors, 12.5% powdered zinc, 10% manganese dioxide, 5% bituminous coal***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used to generate large volumes of smoke for marine time use, or any other desired means.

05-03-036C: Opaque smoke composition for marine use:
Into a suitable ball mill, or vertical mixer, place ***100 grams of hard coal pitch (pre-pulverized)***, followed by ***800 grams of antimony trisulfide***, followed by ***500 grams of sulfur***, followed by ***1500 grams of sodium nitrate***, and then followed by ***1000 grams of ammonium chloride***. Thereafter, tumble or rotate the mixture at 300 RPM for about 2 hours. Thereafter, place the tumbled or rotated mixture into any suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of 95% ethyl alcohol and then followed by 150 milliliters of cold water. Thereafter, blend the mixture on moderate speed for about 45 minutes to form a uniform mass. Thereafter, the mixture is ready for use. To use, place the mixture into any desired press, and press-out the liquid. Thereafter, the pressed mixture simply needs to be pressed into any desired flare body, tube, container, smoke pot, ect, and then dried in an oven, or under vacuum until dry and hard in the usual manner.
Burn rate: Average.

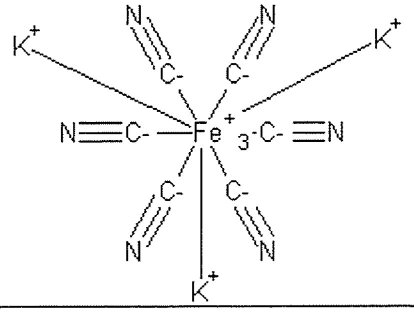
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***38.46% sodium nitrate, 25.64% ammonium chloride, 20.51% antimony trisulfide, 12.82% sulfur, 2.56% coal pitch, 0.01% mixed balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used to generate large volumes of smoke for marine time use, or any other desired means.

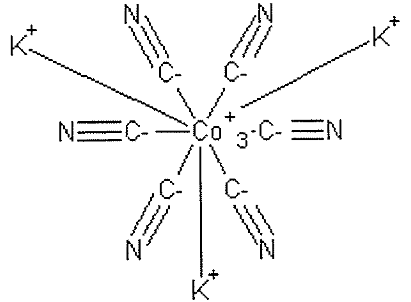
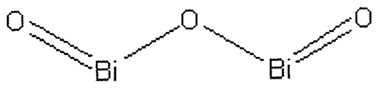
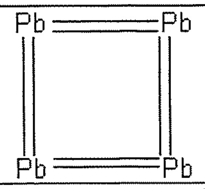
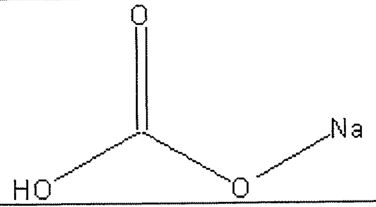
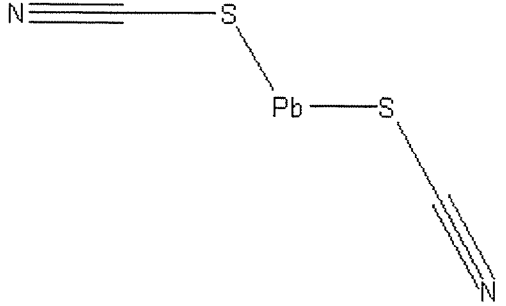
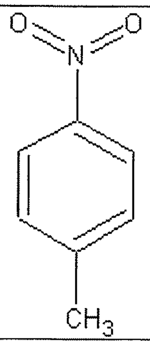
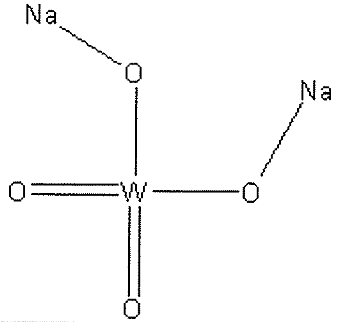
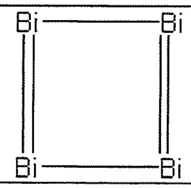
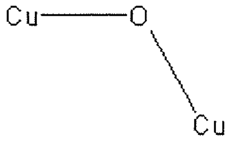
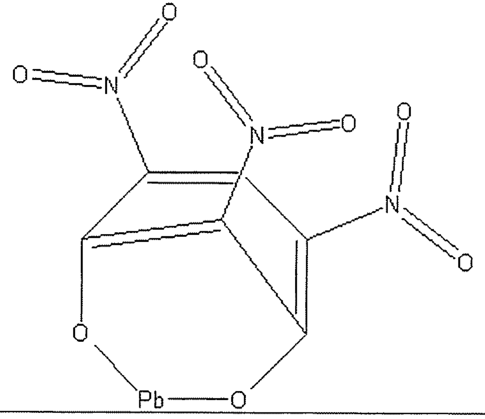
05-03-037A: Under-water launched green smoke composition for marine use:
Into a suitable ball mill, or vertical mixer, place ***191 grams of solvent green dye No. 3***, followed by ***25.5 grams of benzanthrone dye***, followed by ***38 grams of vat yellow No. 4 dye***, followed by ***140 grams of potassium chlorate***, followed by ***115 grams of powdered sugar***, followed by ***20 grams of baking soda powder,*** and then followed by ***25 grams of diatomaceous earth***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desired flare body, tube, container, smoke pot, ect.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***34.44% solvent green dye, 25.24% potassium chlorate, 20.73% sugar, 6.85% vat yellow dye, 4.59% benzanthrone dye, 4.5% diatomaceous earth, 3.6% baking soda, 0.05% mixed residual balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used to generate green smoke for spotting and similar operations during rescues at sea.

05-03-037C: Under-water launched yellow smoke composition for marine use:
Into a suitable ball mill, or vertical mixer, place ***113.4 grams of vat yellow dye No. 4***, followed by ***156.6 grams of benzanthrone dye***, followed by ***125 grams of potassium chlorate***, followed by ***80 grams of powdered sugar,*** followed by ***40 grams of baking soda powder,*** and then followed by ***55 grams of diatomaceous earth***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desired flare body, tube, container, smoke pot, ect.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***27.47% benzanthrone dye, 21.92% potassium chlorate, 19.89% vat yellow dye No. 4, 14.03% powdered sugar, 9.64% diatomaceous earth, 7.01% baking soda, 0.04% mixed residual balance***
Classification: Deflagrating explosive (pyrotechnic mixture).
Use: Used to generate yellow smoke for spotting and similar operations during rescues at sea.

Section 4: Pyrotechnic igniter (starter) and "primer" compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)	**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)	**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)	**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)	**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)	**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)	**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)	**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)	**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)	**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)	**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)	**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)	**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)	**129. Bismuth Subnitrate (see Smoke Generating Compositions)**
130. Calcium Iodate (see Smoke Generating Compositions)	**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)	**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)	**135. Potassium Ferriccyanide**
	 K+ N N K+ C- C- N≡C- Fe+3 -C-≡N C- C- N N K+
	Forms brilliant ruby red crystals. The crystals are soluble in

	water, but only slightly soluble in alcohol and other solvents. The crystals react with acids forming the highly toxic hydrogen cyanide gas. Keep out of contact with acids.
136. Potassium hexacyanocobaltate	**137. Bismuth Trioxide**
	
Forms slightly yellow to pale-yellow crystals. The crystals are freely soluble in water and glacial acetic acid. The crystals are insoluble in alcohol and most common solvents. The solid decomposes into hydrogen cyanide when exposed to acids. Hydrogen cyanide also slowly forms on standing.	Forms a yellowish powder, which is stable in air. The crystals are insoluble in water and the usual solvents, but they are soluble in acids.
138. Titanium powder	**139. Tungsten powder**
$\mathrm{Ti{=}Ti}$	$\mathrm{W{=}W}$
Titanium forms a dark gray powder, which is stable in moist air, but ignites readily upon a flame. The powder is insoluble in water and all known solvents, but reacts with acids in the usual manner. Titanium powder should be stored in a cool dry place.	Powdered tungsten forms a dark gray to bluish gray solid. The solid may ignite spontaneously under certain conditions. The powder readily reacts with acids.
140. Lead Powder	**141. Lead-II-Oxide (red lead; litharge)**
	$\mathrm{Pb{=}O}$
Lead powder is a dark gray solid. Some forms of lead powder may be pyrophoric, and should be stored in air free bottles. Lead powder is insoluble in water and the usual organic solvents.	Exists in two forms, from which the alpha form is the most common, forming a reddish powder. The powder is insoluble in water and the usual solvents. Avoid inhalation of the dust, as the oxide is toxic.
142. Selenium powder	**143. Sodium Bicarbonate**
$\mathrm{Se{=}Se}$	
Selenium has several forms, but the powder can range from dark red to reddish-bluish-black, or grayish bluish black in appearance. The powder is insoluble in water and all known solvents. Selenium powder is stable at room temperature and resists chemical attack from a wide range of chemicals.	Sodium bicarbonate forms a uniform powder, with a salty sour taste. The powder is ready converted into sodium carbonate when heated to high temperature. The bicarbonate is also known as baking soda. Like many carbonates, sodium bicarbonate reacts vigorously with acids.
144. Iron powder	**145. Silicon Dioxide**
$\mathrm{Fe{=}Fe}$	$\mathrm{O{=}Si{=}O}$
Iron powder forms a distinct grayish colored solid, the powder readily ignites when exposed to flames, and the powder readily converts to the oxide when heated. Iron powder is very reactive and will react with many other elements either on contact or when heated. However, iron powder is stable at room temperature.	Forms a white amorphous powder. The powder melts to a glass when heated. Silicon dioxide powder is almost insoluble in water and all organic solvents. One of only a few chemicals capable of reacting with it at ordinary temperatures is hydrofluoric acid.
146. Lead Thiocyanate	**147. Para-Nitrotoluene**
	
Forms a white odorless powder. The powder is toxic so users should avoid skin contact and inhalation of the dust. The powder is insoluble in water and the usual organic solvents.	The para isomer forms yellowish crystals with a melting point of 54 Celsius, and a boiling point of 238 Celsius. The crystals are insoluble in water but soluble in the usual organic solvents. Nitrotoluene is a toxic liquid, so users should wear proper gloves when handling.
148. Silver powder	**149. Sodium Tungstate**
$\mathrm{Ag{-}Ag}$	
Silver powder forms a grayish to grayish white solid. The solid is stable at room temperature and does not tarnish. The powder ready ignites in the presence of flame. The solid is insoluble in water and the usual solvents. Silver is relatively stable to chemical attack.	Forms a dihydrate, which is colorless to white in nature. The crystals become anhydrous when heated to 100 Celsius. The solid is soluble in water, but insoluble in the usual solvents.
150. Zirconium powder	**151. Bismuth powder**
$\mathrm{Zr{=}Zr}$	
Zirconium metal powder forms a bluish gray to bluish black solid. The powder may be a mixture of the crystalline and amorphous styles. Like most metal powders, it readily burns when ignited, and is much more reactive then the solid metal. Mixtures of the powder with oxidizing agents form explosive mixtures.	Forms a dull gray powder, which forms dispersion in water. The powder is insoluble in water and the usual solvents. The powder is stable at room temperature but reacts in the usual manner as other powders.
152. Copper-I-oxide	**153. Lead Styphnate**
	

Forms a brick red powder, granules, or solid masses. The oxide slowly oxidizes to the hydroxide on standing in moist air. The oxide is readily converted to the black version when heated. The oxide is insoluble in water and the usual solvents. It can be made by electrolysizing a dilute hydrochloric acid solution between two copper electrodes.

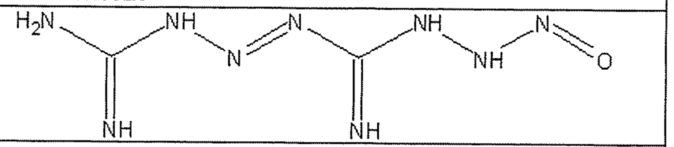
Lead Styphnate has several forms: 1) The amorphous basic lead styphnate forms a yellowish powder, needle-like crystals, or granules, 2) the red basic lead styphnate forms reddish or reddish-brown square prisms, or reddish hexagonal plates, and 3) the normal lead styphnate forms yellowish-orange crystals. All these forms of lead styphnate detonate when heated to about 260 Celsius. All forms are an excellent initiating explosive for use in blasting caps, and detonators. They are also widely used in the preparation of priming mixtures for a variety of applications. All forms of lead styphnate are sensitive to shock, heat, friction, and percussion, but the red basic lead styphnate tends to be the most unstable form. For use in initiation (ignition) compositions, all forms should be desensitized with small amounts of gum Arabic, sulfur, carbon black, dextrose, magnesium sulfate, or starch and mixed with an oxidizer such as barium chromate, lead chromate, copper permanganate, copper perchlorate, or magnesium dichromate.

154. Tellurium Dioxide

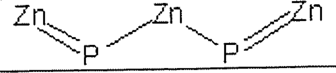
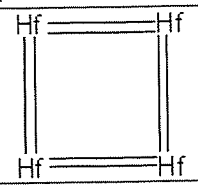
$O=Te=O$

Forms white crystals with a melting point of 733 Celsius. The crystals turn yellow upon heating, forming a yellow liquid at its melting point. The powder is insoluble in water and the usual solvents, but will dissolve in sodium hydroxide solutions, and acids.

155. Tetracene



Tetracene forms pale yellow to lightly yellowish crystals, powder, or fluffy flakes which begin to decompose when heated to 150+ Celsius. The crystals may explode if rapidly heated to 161 Celsius producing a flash of mild light and a smoky bang with the evolution of ammonia. Tetracene is decomposed by hot water and alkalies, and should be stored dry in amber glass bottles, and in a cool place away from light. Tetracene is used heavily in the formation of initiating charges and booster charges in combination with lead azide, diazodinitrophenol, lead styphnate, and other common primary explosives. Tetracene has been replaced by many other primary explosives such as sulfur nitride, and salts of triazoles and tetrazoles for use in blasting caps and detonators. However it can still be used in blasting caps and detonators with satisfactory results when compressed using hydraulic

	presses—tetracene should be packed into blasting caps and detonators under high pressure.
	Method of Preparation 1: Into a suitable flask, equipped with a thermometer, motorized stirrer and powder funnel, add 30 grams of aminoguanidine hydrochloride, followed by 20 milliliters of glacial acetic acid, followed by 5 milliliters of acetic anhydride. Thereafter, gently heat this mixture to 40 Celsius, and stir for 1 hour. Then slowly add, in small portions, 30 grams of sodium nitrite while stirring the reaction mixture and maintaining its temperature at 40 Celsius. After the addition of the sodium nitrite, continue to stir the reaction mixture at 40 Celsius for 1 hour. Afterwards, remove the heat source, and allow the reaction mixture to cool to room temperature. Then drown the entire reaction mixture into 500 milliliters of ice-cold water, and then stir the entire mixture for 24 hours at room temperature. After 24 hours, filter-off the insoluble crystals, and then wash them with three 250 milliliter portions of cold water. Thereafter, vacuum dry or air-dry the crystals, and then place the crystals into a desiccator and dry for 48 hours. Thereafter, place the crystals into a amber glass bottle and store in a cool place until use.
156. Iron Sulfide	**157. Zinc Phosphide**
	
The pure material is a colorless to white solid. Usual commercial grades are a grayish color. The melting point is 1194 Celsius. The crystals are oxidized by moist air, and are insoluble in water and all known solvents; however, the powder reacts with acids with the evolution of hydrogen sulfide gas.	Forms a dark gray to grayish lustrous powder, granules, or masses. The solid has a melting point of 420 Celsius, but the solid usually sublimes before the melting point. Zinc phosphide is stable at room temperature in the absence of moisture, but slowly oxidizes upon standing in moist air. The powder reacts with acids with the formation of the spontaneously flammable gas, phosphine.
158. Copper powder	**159. Hafnium powder**
	
Copper powder forms a reddish ductile solid. The powder readily converts to the oxide upon heating. Copper powder is insoluble in water and all known solvents.	Forms a silvery-white to grayish powder. The powder is highly reactive and may tarnish on exposure to air.

- Ignition and Priming Compositions in this section -

1. 05-04-001A: Shock resistant igniter/primer composition (produces flash and loud report upon ignition): *61% potassium perchlorate, 39% potassium ferricyanide*	**2. 05-04-001B: Modified shock resistant igniter/primer composition (produces flash and loud report upon ignition):** *61% potassium perchlorate, 39% potassium hexacyanocobaltate*
3. 05-04-002A: Igniter composition (produces no flash or report upon ignition): *69.4% potassium dichromate, 30.5% potassium ferricyanide, 0.10% moisture*	**4. 05-04-003A: High altitude igniter composition (can be used in supersonic munitions):** *53.8% zirconium, 23% sulfur, 15.3% potassium perchlorate, 7.6% rubber binder, 0.15% potassium dichromate, 0.15% sodium bisulfite*
5. 05-04-004A: "Invisible", dark burning pyrotechnic igniter mixture for tracer compositions: *63% bismuth trioxide, 35% manganese, 2% graphite*	**6. 05-04-004B: "Invisible", dark burning pyrotechnic igniter mixture for tracer compositions:** *76% barium peroxide, 23% antimony pentasulfide, 1% graphite*
7. 05-04-003A: "Non-violent burning" pyrotechnic igniter element for initiating compositions such as thermite type compositions that have ignition temperatures exceeding 1000 Celsius: *70% iron oxide, 30% titanium*	**8. 05-04-004A: "Therm 64C" igniter composition for magnesium bombs:** *44% iron oxide, 29% barium nitrate, 25% aluminum, 2% sulfur*
9. 05-04-004A: Igniter composition for low velocity rocket propellants: *41.5% potassium chlorate, 28.8% sodium bicarbonate, 16.1% sulfur, 9.6% corn starch, 3.8% nitrocellulose, 0.20% residue*	**10. 05-04-005A: Non-luminous igniter composition for various applications:** *65% tungsten, 25% barium chromate, 10% potassium perchlorate*
11. 05-04-006A: Priming composition (ignition composition) for use in electric blasting caps: *60% lead, 25% selenium, 15% lead-II-oxide*	**12. 05-04-007A: Ignition composition for high performance rocket propellants:** *51.4% iron, 42.6% potassium perchlorate, 3% cellulose acetate, 2.9% aluminum*
13. 05-04-08A: Gasless ignition composition for "thermite" type compositions: *57% copper oxide, 40% manganese, 3% sulfur*	**14. 05-04-008B: Gasless ignition composition for flares, smoke, and other general pyrotechnic compositions:** *35.2% copper oxide, 35.2% silicon, 17.6% lead dioxide, 11.7% calcium silicide, 0.30% residue*
15. 05-04-009A: Ignition composition for tracer compositions: *66.6% barium peroxide, 22.3% magnesium, 11.1% lead tetraoxide*	**16. 05-04-010A: Ignition composition for electric blasting caps and detonators:** *60% lead, 25% selenium, 15% lead-II-oxide*
17. 05-04-011A: Ignition composition for high performance rocket propellants: *65.6% Dupont Teflon No. 6, 32.3% magnesium, 1.9% fumes silica, 0.2% mixed residues*	**18. 05-04-012A: Ignition composition for incendiary compositions:** *50% silicon dioxide, 40% magnesium, 10% polybutadiene binder*
19. 05-04-013A: Ignition composition for electric primers: *68% potassium chlorate, 27% titanium, 5% boron*	**20. 05-04-013B: Ignition composition for electric primers with increased sensitivity (modified):** *76.5% potassium chlorate, 20.4% titanium, 2% boron, 1% lead thiocyanate, 0.10% mixed residues*
21. 05-04-014A: Ignition composition for flares, signals, and smoke candles utilizing black powder: *85% black powder, 10% nitro starch, 5% para-nitrotoluene*	**22. 05-04-015A: Priming composition for blasting caps, and for use in fireworks:** *44.8% potassium chlorate, 25.4% silver, 22.6% antimony sulfide, 4.7% lead dioxide, 0.94% sodium tungstate, 0.94% strontium nitrate, 0.47% copper, 0.15% mixed impurities*
23. 05-04-015B: Priming composition for blasting caps, and for use in fireworks with increased shock resistance: *40% copper ammonium nitrate, 28% aluminum, 25% potassium nitrate, 7% sulfur*	**24. 05-04-016A: Ignition composition for high performance ammonium nitrate/perchlorate rocket propellants:** *53.8% zirconium/nickel alloy, 26.4% potassium perchlorate, 16.5% barium nitrate, 3% ethyl cellulose binder, 0.3% mixed residues*
25. 05-04-016B: Ignition composition for high performance ammonium nitrate/perchlorate rocket propellants (modified): *16.6% aluminum, 16.1% zirconium/nickel alloy, 14% barium nitrate, 13.6% potassium perchlorate, 13% titanium metal, 11.6% zirconium dichromate, 9.4% magnesium, 3.0% ethyl cellulose binder, 1.8% boron, 0.50% mixed residues, 0.4% zirconium hydride burn catalyst*	**26. 05-04-017A: Gasless ignition composition for high performance rocket propellants:** *52.3% iron, 42.8% potassium perchlorate, 4.7% black powder, 0.2% residues*
27. 05-04-018A: Non-gaseous high temperature ignition composition for incendiary mixtures: *65.2% iron powder, 21.7% copper-II-oxide, 13% magnesium, 0.1% mixed impurities*	**28. 05-04-019A: Standard ignition composition for tracer mixtures, smoke compositions, and similar mixtures:** *89.5% barium nitrate, 10.5% magnesium*
29. 05-04-019B: Standard ignition composition for tracer mixtures, smoke compositions, and similar mixtures (modified): *66.6% barium peroxide, 22.3% magnesium, 11.1% lead tetraoxide*	**30. 05-04-020A: Priming composition with heat resistant properties for use in firing lead azide in explosive trains:** *42.8% lead dioxide, 28.5% calcium silicide, 14.2% zirconium, 14.2% sulfur, 0.30% mixed residues*
31. 05-04-020B: Priming composition with heat resistant properties for use in firing lead azide in explosive trains (modified): *37.5% lead dioxide, 20.8% zirconium, 16.6% calcium silicide, 16.6% manganese dioxide, 8.3% sulfur, 0.20% mixed residues*	**32. 05-04-021A: Ignition composition for use in non-electric blasting caps:** *70% metallic bismuth, 25% selenium metal, 5% potassium chlorate*
33. 05-04-022A: Easily ignitable gasless ignition composition for use in igniting incendiary compositions: *70% iron-III-oxide, 30% titanium*	**34. 05-04-022B: Easily ignitable gasless ignition composition for use in igniting incendiary compositions:** *70% iron-III-oxide, 30% zirconium metal*
35. 05-04-023A: Easily ignitable gasless ignition composition for use in igniting incendiary compositions: *47.5% manganese, 40% magnesium, 12.2% titanium/manganese alloy, 0.14% mixed residues, 0.08% titanium, 0.08% zirconium*	**36. 05-04-024A: Priming composition for use in percussion caps:** *25% animal glue binder, 25% oxalic acid, 25% antimony sulfide, 25% potassium chlorate*
37. 05-04-025A: Slow burning, flashless, ignition composition for tracer compositions: *78.4% barium peroxide, 18.4% antimony pentasulfude, 2.2% magnesium, 1% graphite*	**38. 05-04-026A: Ignition composition for welding specifically for tin producing welding compositions:** *36.1% copper-I-oxide, 30.5% copper-II-oxide, 16.6% metal alloy, 8.3%*

	aluminum, 8.3% red phosphorus, 0.20% combined impurities
39. 05-04-027A: Gasless ignition composition for use in electric blasting caps and detonators: *50% zirconium, 50% lead monoxide*	**40. 05-04-028A: Friction sensitive composition for use in primers:** *30% lead styphnate, 28% barium nitrate, 20% glass, 12% lead nitrate, 10% lead hypophosphite*
41. 05-04-028B: Friction sensitive composition for use in primers (tetracene containing): *40% lead styphnate, 30% lead nitrate, 20% glass, 8% lead sulfocyanate, 2% tetracene*	**42. 05-04-029A: Conductive friction sensitive composition for use in primers (non primary explosive containing):** *38.9% zirconium, 35.5% barium nitrate, 25.4% lead dioxide, 0.2% balance*
43. 05-04-030A: Ignition composition for use in delay trains and for generating heat for other ignition operations: *60.6% aluminum, 29.9% iron-III-oxide, 6.7% silicon, 1.9% graphite, 0.78% titanium, 0.15% impurities*	**44. 05-04-030B: Primer composition for use in detonators:** *54.5% potassium chlorate, 27.5% aluminum, 13.5% iron-III-oxide, 3% silicon, 0.86% graphite, 0.35% titanium, 0.29% mixed impurities and balance*
45. 05-04-031A: Priming composition for use in electric blasting caps or for use in electric ignition devices: *57.1% silver metal, 17.1% potassium chlorate, 14.2% mercury metal, 8.5% sulfur, 2.8% red phosphorus, 0.30% balance*	**46. 05-04-032A: Ignition composition for flares and illumination compositions:** *85% barium chromate, 10% boron, 5% magnesium*
47. 05-04-033A: Ignition composition for incendiary agents (magnesium ophorite): *64.3% potassium perchlorate, 33.5% magnesium flake, 1.9% castor oil, 0.3% balance*	**48. 05-04-033B: Ignition composition for incendiary agents (Aluminum ophorite) with increased heat of combustion:** *64.3% potassium perchlorate, 33.5% aluminum flake, 1.9% castor oil, 0.3% balance*
49. 05-04-034A: Heat resistant ignition composition with high thermal stability: *80% tellurium dioxide, 17% aluminum, 3% carbon black*	**50. 05-04-035A: Ignition composition for use in aircraft ejection seats:** *68.37% strontium nitrate, 17% zirconium metal, 6.8% calcium resinate, 5.1% chlorinated rubber, 1.7% zinc stearate, 0.85% dye, 0.18% balance*
51. 05-04-035B: Ignition composition for use in aircraft ejection seats: *68.37% lead dioxide, 17% boron, 6.8% strontium resinate, 5.1% chlorinated rubber, 1.7% zinc stearate, 0.85% dye, 0.18% balance*	**52. 05-04-035C: Ignition composition for use in aircraft ejection seats:** *68.37% barium nitrate, 17% magnesium, 6.8% calcium resinate, 5.1% chlorinated rubber, 1.7% zinc stearate, 0.85% toludiene red, 0.18% balance*
53. 05-04-036A: Priming composition for multiple uses (friction sensitive): *48% potassium chlorate, 36% potassium ferrocyanide, 16% glass powder*	**54. 05-04-037A: Priming composition for use in electric blasting caps with good thermal stability:** *85% cesium decahydrodecaborate, 15% potassium perchlorate*
55. 05-04-037B: Priming composition for use in electric blasting caps with good thermal stability (with increased sensitivity): *73% cesium decahydrodecaborate, 27% potassium perchlorate*	**56. 05-04-037C: Priming composition for use in electric blasting caps with good thermal stability utilizing potassium permanganate:** *55% potassium permanganate, 45% cesium decahydrodecaborate*
57. 05-04-038A: Igniter composition for use in electric ignition devices: *67% potassium perchlorate, 33% titanium hydride*	**58. 05-04-039A: Thermally stable, percussion primer composition for use in primers for shell casings:** *59% potassium perchlorate, 41% titanium metal*
59. 05-04-040A: Friction sensitive ignition composition for friction resistant match head compositions: *40% potassium chlorate, 40% antimony trisulfide, 20% gum Arabic*	**60. 05-04-041A: Ignition composition for smoke grenades:** *57.6% barium nitrate, 17.3% zirconium hydride, 11.5% tetranitrocarbazole, 7.6% silicon, 5.7% epoxy resin, 0.3% mixed impurities*
61. 05-04-042A: Classic highly insensitive ignition composition for use in rapid accelerating projectiles such as tank rounds or artillery rounds: *60% magnesium, 28% silicon dioxide, 12% polybutadiene*	**62. 05-04-042B: Classic highly insensitive ignition composition for use in moderately accelerating projectiles such as mortar rounds:** *70% magnesium, 15% potassium perchlorate, 7.5% silicon dioxide, 7.5% polybutadiene*
63. 05-04-043A: Special primer composition containing high explosives for use in shot gun primers: *38% lead styphnate, 33% barium nitrate, 14% antimony sulfide, 6% aluminum, 5% PETN, 4% tetracene*	**64. 05-04-044A: Ignition composition for use on the tips of matchsticks:** *66.13% potassium chlorate, 13.22% pulverized glass, 9.92% Prussian blue, 4.76% red phosphorus, 3.3% soft wood charcoal, 1.98% animal glue, 0.66% nitrocellulose, 0.03% impurities*
65. 05-04-044B: Ignition composition for use on the tips of matchsticks (modified): *52.79% potassium chlorate, 15.52% pulverize glass, 14.9% Prussian blue, 7.45% furnace black, 6.21% red phosphorus, 3.1% animal glue, 0.03% impurities*	**66. 05-04-045A: Insensitive ignition composition for rockets and missiles:** *49.9% aluminum powder, 40% sodium azide, 10.1% potassium permanganate*
67. 05-04-045B: Insensitive ignition composition for rockets and missiles: *60.1% potassium azide, 29.9% boron powder, 10% potassium permanganate*	**68. 05-04-045C: Insensitive ignition composition for rockets and missiles:** *68.26% zirconium powder, 16.56% sodium azide, 15.06% potassium permanganate, 0.12% mixed balance*
69. 05-04-046A: Insensitive priming/ignition composition for multiple uses: *71.25% boron powder, 23.75% sodium azide, 5% potassium perchlorate*	**70. 05-04-046B: Insensitive priming/ignition composition for multiple uses:** *68.25% aluminum powder, 22.75% sodium azide, 9% barium nitrate*
71. 05-04-047A: Insensitive priming composition for multiple uses: *52.5% boron powder, 30% potassium chlorate, 17.5% sodium azide*	**72. 05-04-048A: Insensitive ignition composition for multiple uses:** *54.9% sodium azide*, *27% boron powder, 10.1% potassium perchlorate, 8% Viton A copolymer binder*
73. 05-04-048B: Insensitive ignition composition for multiple uses: *57.3% potassium azide, 28.7% boron powder, 10.7% potassium perchlorate, 3.3% Kel-F elastomer*	**74. 05-04-048C: Insensitive ignition composition for multiple uses:** *38.4% sodium azide, 38.4% aluminum powder, 19.2% Kel-F copolymer binder, 4% Viton A binder*
75. 05-04-049A: Friction sensitive ignition composition for electric matches, matchsticks, and friction initiated devices: *68.08% phosphorus sulfur compound, 14.89% powdered glass 8.5% iron sulfide, 6.38% animal glue, 2.12% lap black, 0.03% balance,*	**76. 05-04-050A: Non-friction sensitive ignition composition for various operations:** *40% food starch, 35% potassium chlorate, 10% vegetable charcoal, 10% pulverized sawdust, 3% tragacanth gum, 2% potassium dichromate*
77. 05-04-050B: Moderate friction sensitive ignition composition for matchsticks, and other operations: *45% potassium chlorate, 30% antimony trisulfide, 10% glass powder, 8% gum Arabic, 5% lead dioxide, 2% potassium dichromate*	**78. 05-04-050C: Rough friction producing ignition surface for use in combination with matches and other friction sensitive ignition compositions:** *35% glass powder, 30% red phosphorus, 18% antimony trisulfide, 15% animal glue, 2% potassium dichromate*
79. 06-04-051A: Ignition composition for initiating thermite and other incendiary compositions: *77.27% potassium dichromate, 13.63% zinc phosphide, 9.09% aluminum powder, 0.01% mixed residual balance*	**80. 06-04-052A: Priming composition for use in blasting caps:** *37.5% potassium dichromate, 35% copper powder, 15% mossy zinc, 12.5% zinc phosphide*
81. 06-04-053A: Priming composition for use in small arms primers: *50% barium nitrate, 17.85% red phosphorus, 17.85% lead dioxide, 14.28% zirconium metal powder, 0.02% mixed balance*	**82. 06-04-053B: Priming composition for use in small arms primers:** *58.33% barium nitrate, 20.83% red phosphorus, 20.83% antimony trisulfide, 0.01% residual balance*
83. 06-04-054A: Priming composition for use in small arms primers: *72.99% red phosphorus/lead plumbate addition salt, 14.59% potassium chlorate, 10.94% powdered glass, 0.72% gum tragacanth, 0.72% gum Arabic, 0.04% balance*	**84. 06-04-055A: Priming composition for use in small arms primers:** *37.68% potassium chlorate, 37.18% black antimony sulfide, 20.1% nitrocellulose, 5.02% red phosphorus, 0.02% mixed residual balance*
85. 06-04-056A: Gasless ignition composition for smoke pots and smoke grenades: *53.3% red lead, 33.7% silicon, 11.2% manganese, 1.8% celluloid*	**86. 06-04-056B: Gasless ignition composition for smoke pots and smoke grenades:** *76.9% litharge, 19.3% silicon, 1.8% celluloid, 1.5% fullers earth, 0.5% graphite*
87. 06-04-056C: Gasless ignition composition for smoke pots and smoke grenades: *59% lead chromate, 19.6% silicon, 19.6% magnesium powder, 1.8% celluloid*	**88. 06-04-057A: Ignition composition for tracer compositions (with ADN addictive):** *50% barium nitrate, 20% silicon, 15% zirconium hydride, 10% ADN, 5% nitrocellulose*
89. 06-04-058A: Priming composition for use in blasting caps: *44.44% special metal alloy, 22.22% barium nitrate, 22.22% coarse zirconium metal, 11.11% lead dioxide, 0.01% mixed balance*	**90. 06-04-058B: Priming composition for use in blasting caps:** *50% special metal alloy, 20% barium nitrate, 16% zirconium powder, 10% lead dioxide, 4% antimony trisulfide*
91. 06-04-058C: Priming composition for use in blasting caps: *46% special metal alloy, 20% barium nitrate, 20% zirconium metal, 10% lead dioxide, 4% antimony trisulfide*	**92. 06-04-058D: Priming composition for use in blasting caps:** *46% special metal alloy, 20% barium nitrate, 20% zirconium metal, 10% lead dioxide, 4% antimony trisulfide*
93. 06-04-059A: Igniter composition for tracer compositions: *74.86% strontium peroxide, 10.16% calcium silicide, 7.39% calcium resinate, 3.78% barium peroxide, 3.78% lead peroxide. 0.03% residual balance*	**94. 06-04-060A: Specialty high-temperature igniter composition for use in electric "squibs":** *68.6% ground hafnium metal, 26.7% potassium perchlorate, 4.7% nylon binder*
95. 06-04-061A: Classic lead nitrate priming composition for rim-fire ammunition: *33% lead thiocyanate, 30% potassium chlorate, 25% glass powder, 12% lead nitrate*	**96. 06-04-062A: Priming composition for use in non-electric blasting caps:** *40% nitrocellulose, 30% potassium chlorate, 30% potassium ferrocyanide*
97. 06-04-063A: Specialty priming composition for use in ammunition primers: *33% lead styphnate, 21% lead calcium hypophosphate/nitrate complex salt, 20% powdered glass, 16% barium nitrate*	**98. 05-04-064A: Starter composition for ignition of smoke compositions:** *79.92% lead tetraoxide, 16.04% ground silicon powder, 4.02% binder, 0.02% mixed balance*

05-04-001A: Shock resistant igniter/primer composition (produces flash and loud report upon ignition):
Into a large suitable beaker or similar container, place 2.5 liters of water followed immediately by ***305 grams of potassium perchlorate***, and then followed by ***195 grams of potassium ferricyanide***. Then stir the entire mixture rapidly to dissolve all solids. Note: if all solids fail to dissolve, continue adding water in small portions until they do. Once all solids have dissolved, slowly pour in,

2.5 liters of isopropyl alcohol while rapidly stirring the potassium perchlorate solution. After the addition of all the alcohol, continue to rapidly stir the resulting mixture for about 30 minutes at room temperature. Thereafter, filter-off the insoluble mass using gravity filtration or preferably vacuum filtration, and then place the filtered-off mass onto a shallow tray and allow it to thoroughly air-dry. Once the mass is thoroughly air-dry, place it into a clean ball mill filled with 100 grams or so of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 100 RPM for about 2 hours to form a uniform mixture. Thereafter, the mixture can be used as is directly as a powder, or it can be carefully pressed into pellets using the usual hydraulic press equipment.

Burn rate: 9,000 inches per second (energy out-put comparable to lead styphnate).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10+
Ease of ignition (1 to 10): 10+
Tendency to cake: Unknown, but highly un-likely.
Explosive ability: Highly explosive, but not a "high explosive", no pressure wave generated upon ignition.
Percentage: ***61% potassium perchlorate, 39% potassium ferricyanide***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to fire other pyrotechnic compositions mainly rocket propellants, but also smoke mixtures, flares, ect. Can also be used as a primer in fireworks.

Note: this igniter composition should be safety tested in very small amounts before using it to fire nitroglycerine containing gun propellants or rocket fuels as safety information regarding these entities is not available.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. Avoid excessive heat or friction. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with. Either way, safety shields should be used at all times, and any possible source of ignition, including static electricity should be avoided—use static resistant tables and floor mats.

05-04-001B: Modified shock resistant igniter/primer composition (produces flash and loud report upon ignition):
Into a large suitable beaker or similar container, place 2.5 liters of water followed immediately by ***305 grams of potassium perchlorate***, and then followed by ***195 grams of potassium hexacyanocobaltate***. Then stir the entire mixture rapidly to dissolve all solids. Note: if all solids fail to dissolve, continue adding water in small portions until they do. Once all solids have dissolved, slowly pour in, 2.5 liters of isopropyl alcohol while rapidly stirring the potassium perchlorate solution. After the addition of all the alcohol, continue to rapidly stir the resulting mixture for about 30 minutes at room temperature. Thereafter, filter-off the insoluble mass using gravity filtration or preferably vacuum filtration, and then place the filtered-off mass onto a shallow tray and allow it to thoroughly air-dry. Once the mass is thoroughly air-dry, place it into a clean ball mill filled with 100 grams or so of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 100 RPM for about 2 hours to form a uniform mixture. Thereafter, the mixture can be used as is directly as a powder, or it can be carefully pressed into pellets using the usual hydraulic press equipment.

Burn rate: Similar to 05-04-01A (energy out-put comparable to lead styphnate).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 10
Tendency to cake: Unknown, but highly un-likely.
Explosive ability: Highly explosive, but not a "high explosive", no pressure wave generated upon ignition.
Percentage: ***61% potassium perchlorate, 39% potassium hexacyanocobaltate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to fire other pyrotechnic compositions mainly rocket propellants, but also smoke mixtures, flares, ect. Can also be used as a primer in fireworks.

Note: this igniter composition should be safety tested in very small amounts before using it to fire nitroglycerine containing gun propellants or rocket fuels as safety information regarding these entities is not available.

Note: Inexperienced personnel should not attempt this procedure, as there are hazards involved. Avoid excessive heat or friction. This procedure is perfectly safe for experienced persons. To gain experience, preparers should use only small quantities to begin with. Either way, safety shields should be used at all times, and any possible source of ignition, including static electricity should be avoided—use static resistant tables and floor mats.

05-04-002A: Igniter composition (produces no flash or report upon ignition):
Into a large suitable beaker or similar container, place 1700 milliliters of water followed immediately by ***164 grams of potassium dichromate***, and then followed by ***72 grams of potassium ferricyanide***. Then stir the entire mixture rapidly to dissolve all solids. Note: if all solids fail to dissolve, continue adding water in small portions until they do. Once all solids have dissolved, slowly pour in, 1700 milliliters of isopropyl alcohol while rapidly stirring the potassium perchlorate solution. After the addition of all the alcohol, continue to rapidly stir the resulting mixture for about 30 minutes at room temperature. Thereafter, filter-off the insoluble mass using gravity filtration or preferably vacuum filtration, and then place the filtered-off mass onto a shallow tray and allow it to thoroughly air-dry. Once the mass is thoroughly air-dry, place it into a clean ball mill filled with 100 grams or so of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 250 RPM for about 2 hours to form a uniform mixture. Thereafter, the mixture can be used as is directly as a powder, or it can be carefully pressed into pellets using the usual hydraulic press equipment.

Burn rate: Similar to 05-04-01A (energy out-put comparable to lead styphnate).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 10
Tendency to cake: Unknown, but highly un-likely.
Explosive ability: Highly flammable, but not explosive
Percentage: ***69.4% potassium dichromate, 30.5% potassium ferricyanide, 0.10% moisture***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to fire other pyrotechnic compositions such as smoke mixtures, flares, fireworks, and general pyrotechnic mixtures. Note: this mixture is suitable as a primer in fireworks.

05-04-003A: High altitude igniter composition (can be used in supersonic munitions):
Into a suitable beaker or similar container, place 1000 milliliters of water, and then add and dissolve 1.5 grams of sodium dichromate, followed by adding and dissolving 1.5 grams of sodium bisulfate. Thereafter, add in ***350 grams of zirconium powder*** of 325 mesh, and then immediately thereafter boil the mixture at 100 Celsius for 30 minutes. After boiling the mixture for 30 minutes, remove the heat source and allow the mixture to cool to room temperature. Thereafter, filter-off the dichromated coated zirconium powder (using gravity filtration, or preferably vacuum filtration), and then place the collected mass onto a shallow pan and then place this shallow pan in an oven and dry it at 100 Celsius until all moisture has been removed. Now, into a suitable blender or mixing device equipped with a plastic stir blade, place ***150 grams of flours of sulfur***, followed by ***50 grams of "Thiokol"*** (polysulfide synthetic rubber), and then thoroughly blend the mixture for about 30 minutes. After 30 minutes, throw in the dichromated zirconium powder obtained earlier, and then continue to blend the mixture for another 30 minutes on high speed. Finally, add in ***100 grams of potassium perchlorate***, and then continue to rapidly blend the mixture for 1 hour at room temperature. After the blending operation, the mixture is ready to be cured. To do so, it should be casted into any container or mold of any desirable shape or size, and then allowed to cure for a day or so.

Burn rate: Good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 9
Tendency to cake: Unknown, but highly un-likely.
Explosive ability: None.
Percentage: ***53.8% zirconium, 23% sulfur, 15.3% potassium perchlorate, 7.6% rubber binder, 0.15% potassium dichromate, 0.15% sodium bisulfite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to fire pyrotechnic compositions such as smoke mixtures, flares, and general pyrotechnic mixtures used in high-speed projectiles, rockets, and missiles. Can also be used as an igniter composition in general purpose pyrotechnic munitions such as smoke grenades and the like.

05-04-004A: "Invisible", dark burning pyrotechnic igniter mixture for tracer compositions:
Into a suitable blender or mixer equipped with plastic stirring blade, place 75 milliliters of hexane, followed by ***175 grams of powdered manganese*** of 300 mesh, and then blend the mixture on low for about 30 minutes at room temperature. After 30 minutes, throw in ***10 grams of graphite powder***, followed by ***315 grams of bismuth trioxide*** of 300 mesh, and then continue to blend the mixture on low for 1 hour at room temperature. After the mixing operation, place the mixture onto a shallow pan and allow it thoroughly air-dry for several days or so. Thereafter, place the dried mass into a clean ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform mixture. After the one-hour tumbling operation, the powder is ready for use. To use, it needs to be pressed into the cavity of a tracer compartment after the initial tracer composition under high pressure (the same pressure used to press the initial tracer composition).

Burn rate: Moderate
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.

Explosive ability: None.
Percentage: ***63% bismuth trioxide, 35% manganese, 2% graphite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate tracer compositions in tracer bullets for military ammunition ranging from riffles to heavy machine guns, to high caliber projectiles.

05-04-004B: "Invisible", dark burning pyrotechnic igniter mixture for tracer compositions:
Into a suitable blender or mixer equipped with plastic stirring blade, place 175 milliliters of hexane, followed by ***152 grams of barium peroxide*** followed by ***46 grams of antimony pentasulfide***, and then followed by ***2 grams of powdered graphite***, and then blend the mixture on moderate speed until the bulk of the hexane evaporates. Thereafter, place the mixture onto a shallow pan and allow it thoroughly air-dry for several days or so. Thereafter, place the dried mass into a clean ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform mixture. After the one-hour tumbling operation, the powder is ready for use. To use, it needs to be pressed into the cavity of a tracer compartment after the initial tracer composition under high pressure (the same pressures used to press the initial tracer composition).
Burn rate: Moderate
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***76% barium peroxide, 23% antimony pentasulfide, 1% graphite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate tracer compositions for various projectiles.

05-04-003A: "Non-violent burning" pyrotechnic igniter element for initiating compositions such as thermite type compositions that have ignition temperatures exceeding 1000 Celsius:
Into a suitable beaker or similar container, equipped with motorized stirrer using standard wide mouth plastic stirring blade, place ***37.5 grams of titanium powder*** of standard mesh, followed by 63 milliliters of water, and then blend the mixture for about 30 minutes to form a paste. Thereafter, add in ***87.5 grams of red iron-III-oxide***, and then continue to blend the mixture for about 1 hour at room temperature. After the blending operation, press the semi-pasty mass into pellets using any desirable containers, tubes, discs, molds, ect., under a pressure of about 2000 psi. Thereafter, cure the pellets in an oven at 100 Celsius for several hours until they are thoroughly dry.
Burn rate: Low
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% iron oxide, 30% titanium***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate incendiary compositions and thermite-type compositions.

05-04-004A: "Therm 64C" igniter composition for magnesium bombs:
Into a suitable beaker or similar container, equipped with motorized stirrer using standard wide mouth plastic stirring blade, place ***80 grams of aluminum powder*** of standard mesh, followed by ***45 grams of standard grained aluminum***, followed by 23 milliliters of water, and then blend the mixture for about 30 minutes to form a paste. Thereafter, add in ***220 grams of red iron-III-oxide***, followed by 30 milliliters of water, and then followed by ***10 grams of flours of sulfur***, and then continue to blend the mixture for about 1 hour at room temperature. After 1 hour, throw in ***145 grams of barium nitrate***, and then continue to blend the mixture for about 1 hour. After the blending operation, press the semi-pasty mass into pellets using any desirable containers, tubes, discs, molds, ect., under a pressure of about 2000 psi. Thereafter, cure the pellets in an oven at 100 Celsius for several hours until they are thoroughly dry. Note: heating the pellets in a vacuum oven at 80 Celsius works best.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.

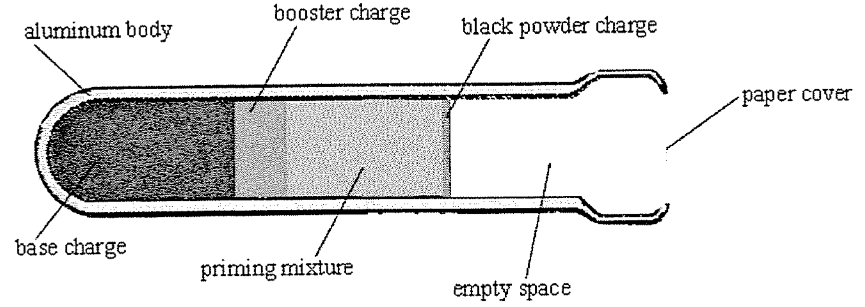
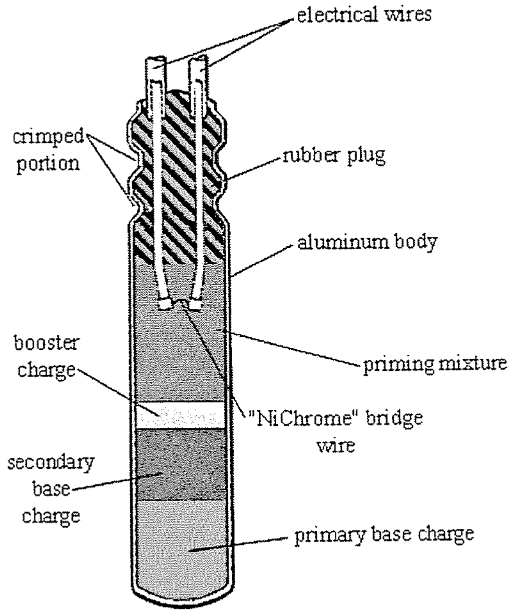
Percentage: ***44% iron oxide, 29% barium nitrate, 25% aluminum, 2% sulfur***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate magnesium containing incendiary munitions.

05-04-004A: Igniter composition for low velocity rocket propellants:
Place into a standard ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, ***150 grams of sodium bicarbonate***, followed by ***50 grams of corn starch***, followed by ***84 grams of flours of sulfur***, and then tumble the mixture at 250 RMP at room temperature for about 30 minutes. After 30 minutes, add in ***216 grams of potassium chlorate***, and then continue to tumble the mixture at 250 RPM for 30 minutes. During this 30 minute mixing period, or before, prepare a second mixture by placing 480 milliliters of acetone into a beaker or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, followed by ***20 grams of nitrocellulose***. Thereafter, thoroughly blend the mixture for about 10 minutes. Now, after the tumbling the potassium chlorate mixture for about 30 minutes, stop the ball mill, and then add the mixture to the acetone/nitrocellulose mixture, and then continue blending the mixture for about 2 hours on high speed at room temperature. After 2 hours, the mixture is ready to go. To use, it needs to be simply poured into any desired containers or molds, and then allowed to cure (i.e., to allow the acetone to evaporate). This liquid starter mixture can be stored in airtight glass bottles for many months if desired. The liquid starter mixture can be poured directly onto other pyrotechnic compositions, rocket propellants (poured right down the core of a rocket motor to coat the rocket propellant, ect., ect.,) and then allowed to cure, i.e., evaporation of the acetone.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.5% potassium chlorate, 28.8% sodium bicarbonate, 16.1% sulfur, 9.6% corn starch, 3.8% nitrocellulose, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate low velocity rocket propellants.

05-04-005A: Non-luminous igniter composition for various applications:
Into a suitable mixing bowl or blender, equipped with motorized stirrer using a standard wide mouth plastic stirring blade or equivalent, place 150 milliliters of hexane, followed by ***325 grams of standard tungsten powder***, followed by ***125 grams of barium chromate***, followed by ***50 grams of potassium perchlorate***, and then blend the mixture for about 1 hour. After blending for about 1 hour, place the mixture onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill filled with about 100 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the mixture at 250 RPM for about 30 minutes to for a uniform mixture. Thereafter, the mixture is ready for use. To use, it needs to be pressed into pellets or equivalent shapes using any desirable mold under a pressure of about 9000 psi.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***65% tungsten, 25% barium chromate, 10% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate flares, smoke grenades, tracer compositions, and incendiary grenades.

05-04-006A: Priming composition (ignition composition) for use in electric/non-electric blasting caps:
Into a special heated ball mill, place ***375 grams of standard lead powder***, and then tumble the mixture at about 50 RPM for 4 hours while heating to 250 Celsius. Note: exclude any shot. After the tumbling operation, remove the heat, and allow the lead powder to cool to room temperature, but during the cool down period, continue to tumble the mixture at about 50 RPM. Thereafter, throw in ***125 grams of standard powdered selenium***, followed by 150 grams of Teflon coated steel shot, and then continue to tumble the mixture at 150 RPM for about 1 hour. After 1 hour the mixture is ready to be used. To use, it should be kept in the form of a fine powder (150 to 350 mesh), and it should be gently pressed into the upper portion of a blasting cap, after the other ingredients have been pressed there to, ect., and the "nichrome" wire should make good surface contact with the powder.
Burn rate: firing time = 173 milliseconds at 1 ampere
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: *60% lead, 25% selenium, 15% lead-II-oxide*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate "Boosters" such as lead azide in blasting caps.

Standard Non-electric blasting cap	**Description**
 aluminum body booster charge black powder charge paper cover base charge priming mixture empty space	Non-electric blasting caps all function in a similar manner. In this case, a black powder time fuse is inserted into the empty space, and this end is then crimped to hold it in place. Thereafter, when the fuse is ignited, the heat reaches the priming mixture. The priming composition is heat sensitive and produces significant energy upon ignition. The priming composition then sets off the booster charge, which in turn sets off the base charge
Standard electric blasting cap	**Description**
 electrical wires crimped portion rubber plug aluminum body booster charge priming mixture "NiChrome" bridge wire secondary base charge primary base charge	Electric blasting caps work in the same manner as non-electric caps, but electrical lead wires replace the black powder time fuse. When an electric current is passed between the Nichrome wire, the wire heats up and sets off the priming mixture.

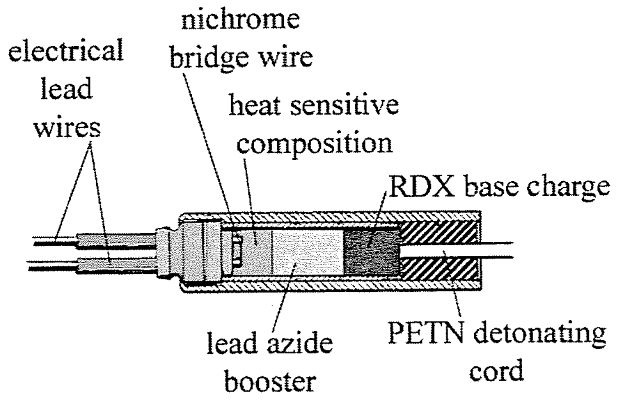
05-04-007A: Ignition composition for high performance rocket propellants:
Into a standard ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, followed by ***265 grams of standard iron powder***, followed by ***15 grams of standard powdered aluminum,*** and then tumble the mixture at about 150 RPM for 1 hour at room temperature. After 1 hour, add in ***220 grams of potassium perchlorate,*** and then continue to tumble the mixture at 150 RPM for about 1 hour. After 1 hour, place the thoroughly tumbled mixture into a mixing bowl, or suitable blender, equipped with motorized stirrer with a plastic stir blade, and then add in ***15.5 grams of cellulose acetate,*** and then blend the mixture on moderate speed for about 1 hour. After 1 hour, the mixture is ready to use. To do so, it needs to be pressed into pellets of any desirable shape and size, according to the size and dimensions of your rocket, under a moderate pressure using any typical hydraulic press.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: *51.4% iron, 42.6% potassium perchlorate, 3% cellulose acetate, 2.9% aluminum*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate high performance rocket propellants.

05-04-08A: Gasless ignition composition for "thermite" type compositions:
Into a suitable beaker or similar container, equipped with motorized stirrer with a plastic stir blade, place 500 milliliters of 95% ethyl alcohol or 500 milliliters of denatured alcohol, followed by ***285 grams of copper-II-oxide***, followed by ***200 grams of finely divided manganese***, and then followed by ***15 grams of powdered sulfur***, and then blend the mixture on high for about 2 hours to form a uniform insoluble mass. After blending for about 2 hours, stop the blending, and then filter-off the insoluble mixture using gravity filtration, or preferably vacuum filtration. Once the wet mass has been collected, spread it out over a shallow pan and allow it to thoroughly air-dry until the smell of solvent is gone. Thereafter, pulverize the dried mass using a spatula, mortar & pestle, or any other suitable means to form a uniform powder. Thereafter, the mixture is ready for use. To use, it needs only to be pressed into any desirable grenade, container, tube, ect., after pressing in the original incendiary composition, under a pressure of 10,000 to 12,000 psi using the normal techniques.
Burn rate: Slow
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: *57% copper oxide, 40% manganese, 3% sulfur*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate incendiary composition.

05-04-008B: Gasless ignition composition for flares, smoke, and other general pyrotechnic compositions:
As in the previous procedure, simply place into a suitable beaker or similar container, equipped with motorized stirrer with a plastic stir blade, place 500 milliliters of 95% ethyl alcohol or 500 milliliters of denatured alcohol, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of finely divided silicon powder***, followed by ***50 grams of calcium silicide***, and then followed by ***75 grams of lead dioxide***, and then blend the mixture on high for about 2 hours to form a uniform insoluble mass. After blending for about 2 hours, stop the blending, and then filter-off the insoluble mixture using gravity filtration, or preferably vacuum filtration. Once the wet mass has been collected, spread it out over a shallow pan and allow it to thoroughly air-dry until the smell of solvent is gone. Thereafter, pulverize the dried mass using a spatula, mortar & pestle, or any other suitable means to form a uniform powder. Thereafter, the mixture is ready for use. To use, it needs only to be pressed into any desirable grenade, container, tube, ect., after pressing in the original or main pyrotechnic composition, under a pressure of 3000 to 6000 psi using the normal techniques.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: *35.2% copper oxide, 35.2% silicon, 17.6% lead dioxide, 11.7% calcium silicide, 0.30% residue*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate general pyrotechnic compositions.

05-04-009A: Ignition composition for tracer compositions:
Into a standard ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter or so, place ***111.5 grams of standard magnesium powder***, followed by ***55.5 grams of lead tetraoxide*** (Pb3O4), followed by ***333 grams of barium peroxide***, and then add in 75 milliliters of hexane and then tumble the mixture at about 100 RPM for about 2 hours at room temperature. After 2 hours, pour the entire mixture onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 100 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, it needs to be pressed into the rear end of the tracer cavity/compartment, after the original tracer composition under the same pressure as was the tracer composition pressed.
Burn rate: Good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: *66.6% barium peroxide, 22.3% magnesium, 11.1% lead tetraoxide*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate tracer compositions.

05-04-010A: Ignition composition for electric blasting caps and detonators:
Into a standard heated ball mill, minus the steel shot, place ***375 grams of standard lead powder***, and then tumble the lead powder at 50 RPM at 250 Celsius for 4 hours. Note: keep the ball mill open so it can be exposed to air. After 4 hours, remove the heat source and allow the lead powder to cool to room temperature. Note: during the cool down period, continue to tumble the lead powder. Thereafter, place the oxidized lead powder into a suitable mixing bowl, or blender, equipped with motorized stirrer utilizing a plastic stir blade, and then add in 150 milliliters of 95% ethyl alcohol, followed by ***125 grams of finely dived selenium powder***, and then blend the mixture on moderate speed for about 1 hour. After 1 hour, place the blended mixture onto a shallow pan, and allow it to thoroughly air-dry. When it has been thoroughly dried, place the dried mass into clean ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, it simple needs to be pressed into pre-molds, ranging from 5 to 10 millimeters in diameter by 5 to 10 millimeters in length, depending on the dimensions of the blasting cap/detonator, under pressure of about 1500 psi, to form pellets. These pellets are then inserted into the outer end of any blasting cap or detonator, and then electrical lead wires, i.e., as of Nichrome wire should be pressed into the pellets.
Burn rate: Fast
Firing time: 173 microseconds at 1 ampere.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Explodes readily when ignited.
Percentage: ***60% lead, 25% selenium, 15% lead-II-oxide***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in blasting caps and detonators in place of lead styphnate/barium chromate priming mixtures.

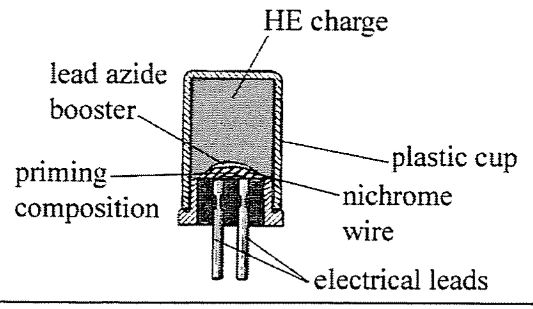
Standard blasting cap for typical means
 nichrome bridge wire electrical lead wires heat sensitive composition RDX base charge lead azide booster PETN detonating cord
Details:
Electrically initiated blasting cap, with PETN detonating cord insert. These caps are designed to initiate PETN detonating cords for initiating large masses of explosives tied in series.

05-04-011A: Ignition composition for high performance rocket propellants:
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing plastic stir blades of the Teflon type, place ***165 grams of finely powdered magnesium*** of 325 mesh, followed by ***335 grams of finely divided Dupont Teflon No. 6 product***, followed by ***10 grams of fumed colloidal silica*** (sold as the trade name Cab-O-Sil), and then followed by 150 milliliters of acetone. Thereafter, blend the mixture on moderate speed until nearly all the acetone has evaporated. Afterwards, place the near dry blended mixture onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mixture into a clean ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture for about 30 minutes at 150 RPM to form a uniform powder. Thereafter, the mixture is ready for use. To use, it needs to be pressed into any desirable pellets, discs, rods, ect., under a high pressure using a standard hydraulic press. Can be readily ignited using a match, primer, or electric wire.
Burn rate: Moderate
Energy of ignition: 1980 cal/gm
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8
Tendency to cake: None.

Explosive ability: None.
Percentage: ***65.6% Dupont Teflon No. 6, 32.3% magnesium, 1.9% fumes silica, 0.2% mixed residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate solid rocket propellants in rockets and missiles.

05-04-012A: Ignition composition for incendiary compositions:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***200 grams of magnesium powder*** of standard mesh, followed by ***250 grams of powdered silicon dioxide***, followed by ***50 grams of finely powdered polybutadiene***, and then followed by 75 milliliters of 95% ethyl alcohol, and then tumble the mixture at 150 RPM at room temperature for about 30 minutes. Thereafter, place the tumbled mixture onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mixture back into a clean ball mill, filled the usual amount of Teflon coated steel shot, and then tumble the mixture for about 30 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, it needs to be pressed into any desirable pellets, discs, rods, ect., under a high pressure using a standard hydraulic press. Can be readily ignited using a match, primer, or electric wire.
Burn rate: Moderate
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% silicon dioxide, 40% magnesium, 10% polybutadiene binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate incendiary agents. Can also be used as a direct incendiary agent for artillery shells.

05-04-013A: Ignition composition for electric primers:
Into a suitable mixing bowl, drum, blender, ect., place ***135 grams of standard titanium powder*** of average commercial mesh, followed by ***340 grams of potassium chlorate***, followed by ***25 grams of boron powder*** of average mesh, and then add in 150 milliliters of diethyl ether, and then blend the entire mixture until the bulk of the ether evaporates. When the bulk of the ether has evaporated, place the remaining mass into a ball mill, filled with 200 grams of Teflon coated steel shot of 5 to 10 millimeters in diameter, and then tumble the mixture at 100 to 150 RPM for about 20 to 30 minutes at room temperature. Thereafter, the mixture should be dry blended to form a powder of good uniformity. Once this point is reached, the mixture is ready to be pressed. To do so, it should be pressed into any desirable pellets, discs, rods, or pressed directly into any tube, blasting cap, ect., under a pressure of 3000 psi. Readily ignites by a hot wire and/or an electrical wire and 9-volt battery.
Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Ignites readily.
Percentage: ***68% potassium chlorate, 27% titanium, 5% boron***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as an initiator in electric blasting caps.

Classic electric squibb	**Details:**
 HE charge lead azide booster plastic cup priming composition nichrome wire electrical leads	Electric squibs are commonly used in commercial and industrial applications, such as movie sets, special effects, and in mining operations. The devices work just like electric blasting caps.

05-04-013B: Ignition composition for electric primers with increased sensitivity (modified):
This procedure is identical to 05-06-013A, but with increased sensitivity carried out by the introduction of lead thiocyanate. Into a suitable mixing bowl, drum, blender, ect., place ***100 grams of standard titanium powder*** of average commercial mesh, followed by ***375 grams of potassium chlorate***, followed by ***10 grams of boron powder*** of average mesh, followed by ***5 gram of lead thiocyanate***,

and then add in 175 milliliters of diethyl ether, and then blend the entire mixture until the bulk of the ether evaporates. When the bulk of the ether has evaporated, place the remaining mass into a ball mill, filled with 200 grams of Teflon coated steel shot of 5 to 10 millimeters in diameter, and then tumble the mixture at 50 to 100 RPM for about 20 to 30 minutes at room temperature. Thereafter, the mixture should be a dried blended powder of good uniformity. Once this point is reached, the mixture is ready to be pressed. To do so, it should be pressed into any desirable pellets, discs, rods, or pressed directly into any tube, blasting cap, ect., under a pressure of 3000 psi. Readily ignites by a hot wire and/or an electrical wire and 9-volt battery.

Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Ignites readily.
Percentage: ***76.5% potassium chlorate, 20.4% titanium, 2% boron, 1% lead thiocyanate, 0.10% mixed residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as an initiator in electric blasting caps.

Improvised Barb-wire anti-personnel mine	**Details/description:**
blasting cap Electrical lead wires High explosive block Razor wire	Barbed wire anti-personnel mine. Note: as the firer, you must maintain at least a 150 meter distance from the mine to prevent self-injury.

Improvised Explosive mixtures utilizing low velocity explosives:		
Low velocity explosive	*Priming type and weight*	*Fragmentation weight*
1. Ammonium nitrate (10 parts by weight).	Prime with TNT (2 ½ parts by weight)	Use 5 parts of steel shot, nuts, bolts, or nails
2. Black powder (10 parts by weight).	Prime with TNT, or dynamite (3 ½ parts by weight)	Use 5 parts of steel shot, nuts, bolts, or nails
3. Potassium nitrate (10 parts by weight).	Prime with TNT, dynamite (4 ½ parts by weight)	Use 5 parts of steel shot, nuts, bolts, or nails
4. Potassium chlorate (10 parts by weight).	Prime with 3 ½ parts of TNT, or dynamite	Use 4 ½ parts of steel shot, nuts, bolts, or nails
5. Potassium perchlorate (10 parts by weight).	Prime with 3 ½ parts of TNT, or dynamite	Use 4 ½ parts of steel shot, nuts, bolts, or nails
6. Potassium permanganate (10 parts by weight).	Prime with a mixture of 3 parts of TNT, and 1 part of black powder (mix the black powder thoroughly with powdered TNT, and then press into block. Use this block for direct priming).	Use 4 ½ parts of steel shot, nuts, bolts, or nails.
7. Potassium dichromate (10 parts by weight).	Prime with a mixture of 3 parts of TNT, or PETN, and 1 part of lead-VI-chromate (mix the chromate thoroughly with powdered TNT, and then press into block. Use this block for direct priming).	Use 4 ½ parts of steel shot, nuts, bolts, or nails.
8. Barium nitrate (10 parts by weight).	Prime with a mixture of 3 parts of TNT, or PETN, and 1 part of antimony trisulfide (mix the trisulfide thoroughly with powdered TNT, and then press into block. Use this block for direct priming).	Use 4 parts of steel shot, nuts, bolts, or nails.
9. Ammonium perchlorate (10 parts by weight).	Prime with TNT (3 parts by weight)	Use 5 parts of steel shot, nuts, bolts, or nails.
10. Lead nitrate (anhydrous) (10 parts)	Prime with TNT, PETN, or dynamite (3 parts by weight)	Use 5 to 6 parts steel shot, nuts, bolts, or nails.

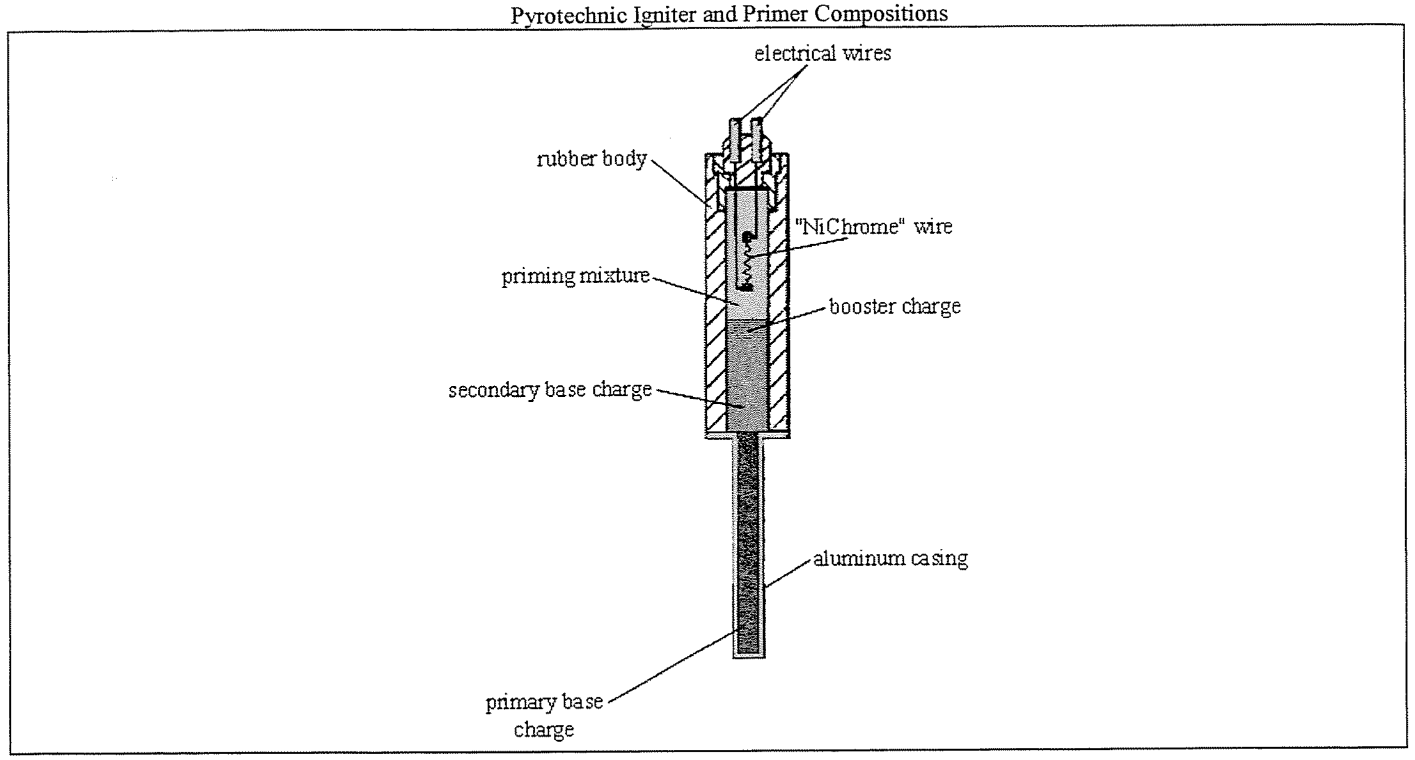
05-04-014A: Ignition composition for flares, signals, and smoke candles utilizing black powder:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***425 grams of finely divided black powder*** of any quality, followed by ***50 grams of nitro starch***, and then followed by ***25 grams of para-nitrotoluene***, and then add in 150 milliliters of diethyl ether, and then blend the entire mixture on moderate speed until the bulk of the ether evaporates. Once this point has been reached, continue to blend the mixture for about 30 minutes to form a plastic mass. After 30 minutes, the mixture is ready to be casted. To do so, the plastic-like mass should be pressed into any desirable mold, container, ect, and then allowed to cure for several days. Can be easily ignited using a match or similar device.

Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***85% black powder, 10% nitro starch, 5% para-nitrotoluene***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to ignite flares, signal compositions, smoke compositions, and similar pyrotechnics.

05-04-015A: Priming composition for blasting caps, and for use in fireworks:
Into a standard horizontal empty ball mill, place ***4 grams of sodium tungstate***, followed by ***2 grams of powdered copper***, followed by ***4 grams of strontium nitrate***, followed by ***96 grams of antimony sulfide***, followed by ***108 grams of precipitated silver***, followed by ***190 grams of potassium chlorate***, and finally followed by ***20 grams of lead dioxide***, and then gently tumble the mixture at 25 to 50 RPM for several hours to form a uniform mix. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into any blasting cap or detonator housing under the usual mean. For use as a primer for aerial shells, the mixture needs to be moistened with ether to form a paste, and then coated on the aerial shells, and allowed to dry. For use in blasting caps, the dry pressed mixture can be ignited using a hot wire, such as Nichrome wire, or spark, or electric arc.

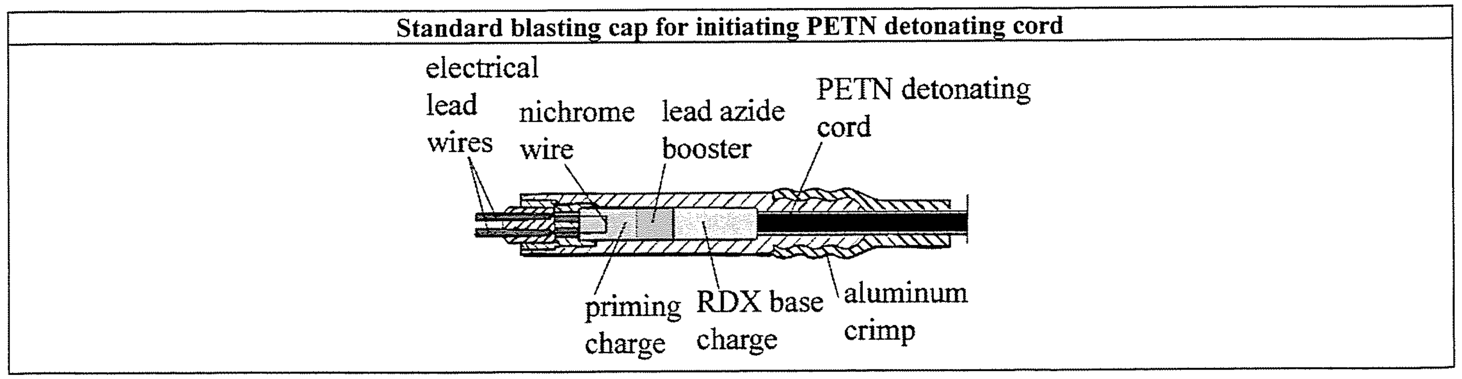
Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***44.8% potassium chlorate, 25.4%silver, 22.6% antimony sulfide, 4.7% lead dioxide, 0.94% sodium tungstate, 0.94% strontium nitrate, 0.47% copper, 0.15% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in blasting caps, or for priming aerial shells for use in fireworks.

Electric blasting system



05-04-015B: Priming composition for blasting caps, and for use in fireworks with increased shock resistance:
Into a standard horizontal empty ball mill, place ***200 grams of copper ammonium nitrate***, followed by ***125 grams of potassium nitrate***, followed by ***35 grams of flours of sulfur***, followed by ***140 grams of finely divided aluminum powder***, and then gently tumble the mixture at 100 RPM for 48 hours at room temperature to form a uniform mix. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into any blasting cap or detonator housing under the usual means. For use as a primer for aerial shells, the mixture needs to be moistened with ether or hexane to form a paste, and then coated on the aerial shells, and allowed to dry. For use in blasting caps, the dry pressed mixture can be ignited using a hot wire, such as Nichorme wire, or spark, or electric arc.
Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***40% copper ammonium nitrate, 28% aluminum, 25% potassium nitrate, 7% sulfur***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in blasting caps, or for priming aerial shells for use in fireworks.

Standard blasting cap for initiating PETN detonating cord



05-04-016A: Ignition composition for high performance ammonium nitrate/perchlorate rocket propellants:
Into a suitable beaker or similar container, place ***25 grams of ethyl cellulose***, and then add in 500 milliliters of acetone. Thereafter, stir the mixture to dissolve the ethyl cellulose. In the meantime, place into a standard empty ball mill ***219.9 grams of potassium perchlorate***, followed by ***137.7 grams of barium nitrate***, followed by ***447.3 grams of finely powdered zirconium/nickel alloy*** containing 25% zirconium and 75% nickel, and then tumble the mixture at 100 RPM for several hours. After several hours, place this dried blended mixture into the ethyl cellulose/acetone solution, and then blend the combined mixture on moderate speed until the bulk of the acetone evaporates, and a mild pasty mass remains. Thereafter, the mixture is ready to be pressed. To do so, the pasty mass needs to be pressed into pellets of any desirable shape and diameter, under average pressure, and the resulting pellets should then be cured for several days to facilitate proper evaporation of the acetone, and setting of the ethyl cellulose binder. Can be initiated by any electric squib or similar means.

Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None, but ignites vigorously.
Percentage: ***53.8% zirconium/nickel alloy, 26.4% potassium perchlorate, 16.5% barium nitrate, 3% ethyl cellulose binder, 0.3% mixed residues***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Widely used in the ignition of high performance rocket propellants.

05-04-016B: Ignition composition for high performance ammonium nitrate/perchlorate rocket propellants (modified):
Into a suitable beaker or similar container, place ***30 grams of ethyl cellulose***, and then add in 600 milliliters of acetone. Thereafter, stir the mixture to dissolve the ethyl cellulose. In the meantime, place into a standard empty ball mill ***136 grams of potassium perchlorate***, followed by ***140 grams of barium nitrate***, followed by ***160 grams of finely powdered zirconium/nickel alloy***, containing 25% zirconium and 75% nickel, followed by ***116 grams of zirconium dichromate***, followed by ***165 grams of finely powdered aluminum***, followed by ***94 grams of finely powdered magnesium***, followed by ***130 grams of finely powdered titanium metal***, followed by ***4 grams of zirconium hydride***, and then followed by ***18 grams of finely divided boron***, and then tumble the mixture at 100 RPM for several hours. After several hours, place this dried blended mixture into the ethyl cellulose/acetone solution, and then blend the combined mixture on moderate speed until the bulk of the acetone evaporates, and a mild pasty mass remains. Thereafter, the mixture is ready to be pressed. To do so, the pasty mass needs to be pressed into pellets of any desirable shape and diameter, under average pressure, and the resulting pellets should then be cured for several days to facilitate proper evaporation of the acetone, and setting of the ethyl cellulose binder. Can be initiated by any electric squib or similar means.
Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None, but ignites vigorously.
Percentage: ***16.6% aluminum, 16.1% zirconium/nickel alloy, 14% barium nitrate, 13.6% potassium perchlorate, 13% titanium metal, 11.6% zirconium dichromate, 9.4% magnesium, 3.0% ethyl cellulose binder, 1.8% boron, 0.50% mixed residues, 0.4% zirconium hydride burn catalyst***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Widely used in the ignition of high performance rocket propellants.

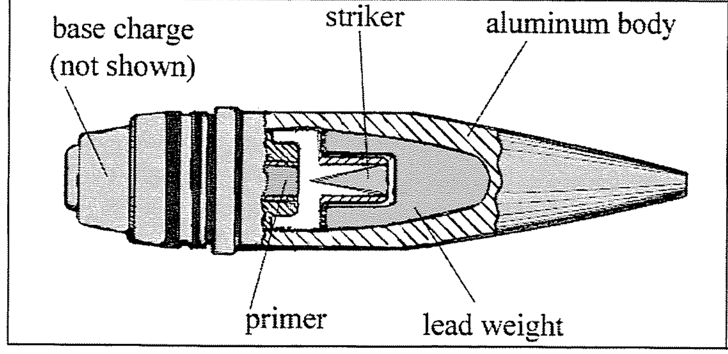
05-04-017A: Gasless ignition composition for high performance rocket propellants:
Into a standard empty ball mill in the usual manner, place ***225 grams of potassium perchlorate***, followed by ***275 grams of iron powder***, followed by ***25 grams of black powder***, and then tumble the mixture at 100 to 150 RPM for about 30 to 40 minutes to form a uniform mixture. Thereafter, the mixture is ready to be pressed. To do so, it simply needs to be pressed into any desirable pellets, discs, rods, or any other shape or size depending on the dimensions of the rocket engine, under a pressure of about 10000 psi. Note: instead of pressing the mixture at high pressure, it can be moistened with ether or hexane to form a paste, and then pressed into any desirable mold, container, ect., in the usual manner and then allowing the composition to cure. The mixture can be ignited using any electric squib or similar electrical ignition system in the usual means.
Burn rate: Fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None, but ignites vigorously.
Percentage: ***52.3% iron, 42.8% potassium perchlorate, 4.7% black powder, 0.2% residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in the ignition of high performance rocket propellants.

05-04-018A: Non-gaseous high temperature ignition composition for incendiary mixtures:
Into a standard empty ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***150 grams of iron powder of average mesh***, followed by ***50 grams of finely powdered copper-II-oxide***, followed by ***30 grams of finely powdered magnesium***, and then tumble the mixture at 100 to 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready to be pressed. To do so, it simply needs to be pressed into any desirable pellets, discs, rods, or any other shape or size under a pressure of about 10000 psi. Note: instead of pressing the mixture at high pressure, it can be moistened with ether or hexane to form a paste, and then pressed into any desirable mold, container, ect., in the usual manner and then allowing the composition to cure. This composition can be ignited using standard methods, but may not work properly utilizing an electric squib.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 8 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: *65.2% iron powder, 21.7% copper-II-oxide, 13% magnesium, 0.1% mixed impurities*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Widely used mixture for the ignition of incendiary agents.

05-04-019A: Standard ignition composition for tracer mixtures, smoke compositions, and similar mixtures:
Into a suitable mixing bowl, blender, or similar container, equipped with the usual style of motorized stirrer, place ***447.5 grams of barium nitrate***, followed by ***52.5 grams of finely powdered magnesium***, and then add in 150 milliliters of ether or hexane, and then blend the mixture on moderate speed until the bulk of the solvent has evaporated. Once the bulk of the solvent has evaporated, place the semi-pasty mass into a suitable ball mill, filled with 250 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform mixture, and then allow the remaining solvent to evaporate. Thereafter, the mixture is ready to be pressed. To do so, it simply needs to be pressed into any desirable pellets, tablets, discs, rods, ect., under a pressure of about 3000 psi, and then allowed to cure for a day or so. The mixture can be ignited using any suitable means, and can be readily ignited using any electric squib.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: *89.5% barium nitrate, 10.5% magnesium*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Widely used mixture for the ignition of tracer compositions, smoke compositions, flares, and similar mixtures.

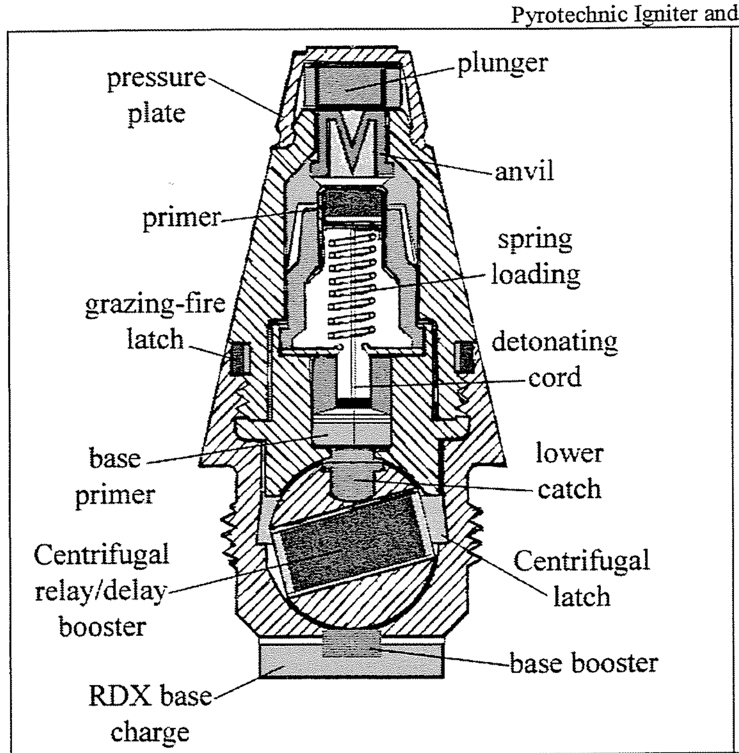
05-04-019B: Standard ignition composition for tracer mixtures, smoke compositions, and similar mixtures (modified):
Into a suitable mixing bowl, blender, or similar container, equipped with the usual style of motorized stirrer, place ***333 grams of barium peroxide***, followed by ***55.5 grams of lead tetraoxide (Pb3O4),*** followed by ***111.5 grams of finely powdered magnesium***, and then add in 150 milliliters of ether or hexane, and then blend the mixture on moderate speed until the bulk of the solvent evaporates. Once the bulk of the solvent has evaporated, place the semi-pasty mass into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 100 RPM for about 1 hour to form a uniform mixture, and then allow the remaining solvent to evaporate. Thereafter, the mixture is ready to be pressed. To do so, it simply needs to be pressed into any desirable pellets, tablets, discs, rods, ect., under a pressure of about 3000 psi, and then allowed to cure for a day or so. The mixture can be ignited using any suitable means, and can be readily ignited using any electric squib.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: *66.6% barium peroxide, 22.3% magnesium, 11.1% lead tetraoxide*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Widely used mixture for the ignition of tracer compositions, smoke compositions, flares, and similar mixtures.

05-04-020A: Priming composition with heat resistant properties for use in firing lead azide in explosive trains:
Into a suitable mixing bowl, place 150 milliliters of diethyl ether, followed by ***36 grams of calcium silicide***, followed by ***18 grams of finely powdered zirconium***, followed by ***18 grams of finely powdered sulfur***, and then manually blend the mixture using a spatula or similar utensil for about 5 to 10 minutes. Thereafter, add in ***54 grams of lead dioxide***, and then blend the mixture using a motorized stirrer on low speed until the bulk of the solvent evaporates. Thereafter, you can either screen the pasty mass through any desirable sized holes to form granules, or the paste can be thoroughly dried, and then pulverized, and the resulting grains then separated using sieves. You should use grains ranging from 0.5 to 1 millimeter for proper priming in the anvil.
Burn rate: Rapid.
Sensitivity (drop test): 2 ¾ inches using a 4-ounce weight.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (based on sensitivity).
Tendency to cake: None.
Explosive ability: Explodes on percussion.
Percentage: *42.8% lead dioxide, 28.5% calcium silicide, 14.2% zirconium, 14.2% sulfur, 0.30% mixed residues*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in primers initiated by firing pins for igniting lead azide and other primary explosives in blasting caps and detonators for use in gravity bombs.

Fuze for hard target projectiles	**Description:**
 base charge (not shown) striker aluminum body primer lead weight	The fuze illustrated adjacent works upon impact of a hard target. When the projectile hits a hard target, the nose collapses rearwards, causing the striker assembly to impact into a primer. The primer sets of the explosive train, which detonates the main charge (not shown).

05-04-020B: Priming composition with heat resistant properties for use in firing lead azide in explosive trains (modified):
As in the above procedure, into a suitable mixing bowl, place 150 milliliters of diethyl ether, followed by ***24 grams of calcium silicide***, followed by ***30 grams of finely powdered zirconium***, followed by ***12 grams of finely powdered sulfur***, followed by ***24 grams of manganese dioxide***, and then manually blend the mixture using a spatula or similar utensil for about 5 to 10 minutes. Thereafter, add in ***54 grams of lead dioxide***, and then blend the mixture using a motorized stirrer on low speed until the bulk of the solvent evaporates. Thereafter, you can either screen the pasty mass through any desirable sized holes to form granules, or the paste can be thoroughly dried, and then pulverized, and the resulting grains then separated using sieves. You should use grains ranging from 0.5 to 1 millimeter for proper priming in the anvil.
Burn rate: Rapid.
Sensitivity (drop test): 4 ½ inches using a 4-ounce weight.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (based on sensitivity).
Tendency to cake: None.
Explosive ability: Explodes on percussion.
Percentage: *37.5% lead dioxide, 20.8% zirconium, 16.6% calcium silicide, 16.6% manganese dioxide, 8.3% sulfur, 0.20% mixed residues*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in primers initiated by firing pins for igniting lead azide and other primary explosives in blasting caps and detonators for use in gravity bombs.

Classic fuze for artillery and mortar shells	**Details:**



In this illustration, a classic impact fuze is shown. The fuze is armed, when the projectile is fired. The arming is caused by the centrifugal force, which forces the relay/delay booster to right it self north to south of the fuze. Thereafter, when the shell impacts with a target, the plunger is forced rearward striking a primer. The primer ignites the detonating cord, which in turn sets-off the explosive train contained in the centrifugal relay/delay booster assembly. The spring loading is carried upon the grazing fire latch, and releases a striker pin, that sets off a base primer assembly. The grazing fire latch is activated when the shell "grazes" the target, rather then hitting it head on.

05-04-021A: Ignition composition for use in non-electric blasting caps:
Into a suitable ball mill, filled with 100 grams of Teflon coated steel shot of the usual diameter, place ***140 grams of finely powdered metallic bismuth***, followed by ***50 grams of finely powdered selenium metal***, and then followed by ***10 grams of potassium chlorate***, and then tumble the mixture at 50 to 75 RPM for about 30 minutes to form a uniform mixture. Thereafter, the mixture is ready to use. To use, the powder only needs to be pressed into any blasting cap or similar device.
Burn rate: Nominal.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***70% metallic bismuth, 25% selenium metal, 5% potassium chlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as an ignition composition in non-electric blasting caps to initiate lead azide and other primary explosive elements. This ignition composition is ignited by a standard black powder time fuse.

05-04-022A: Easily ignitable gasless ignition composition for use in igniting incendiary compositions:
Into a suitable beaker, or similar container, place ***37.5 grams of finely powdered titanium metal***, followed by 60 milliliters of water. Thereafter, manually blend the mixture using a non-conductive spatula or similar utensil for about 10 to 15 minutes to form a uniform paste. Thereafter, add in ***87.5 grams of finely powdered red iron-III-oxide***, and then continue to manually blend the mixture for about 10 to 15 minutes. Afterwards, place the paste onto a shallow pan or tray, and then allow it to thoroughly air-dry. Note: blowing air over the paste using a cooling fan can help speed up the process. Once the mixture is dried, it needs to be pulverized by placing it into a ball mill, filled with 100 grams or so of Teflon coated steel shot, and then tumbled at 150 RPM for about 50 to 20 minutes. Thereafter, the powder is ready for use. To use, the powder needs to be pressed into any desirable container, tube, mold, ect., under high pressure. This composition is readily ignited by a primer, and is intended to be ignited by such an element.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***70% iron-III-oxide, 30% titanium***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate incendiary compositions, especially in incendiary grenades.

05-04-022B: Easily ignitable gasless ignition composition for use in igniting incendiary compositions:
This procedure is identical to the above procedure, but the titanium is simply replaced with zirconium. Into a suitable beaker, or similar container, place ***54 grams of finely powdered zirconium metal***, followed by 60 milliliters of water. Thereafter, manually blend the mixture using a non-conductive spatula or similar utensil for about 10 to 15 minutes to form a uniform paste. Thereafter, add in ***66 grams of finely powdered red iron-III-oxide***, and then continue to manually blend the mixture for about 10 to 15 minutes. Afterwards, place the paste onto a shallow pan or tray, and then allow it to thoroughly air-dry. Note: blowing air over the paste using a cooling fan can help speed up the process. Once the mixture is dried, it needs to be pulverized by placing it into a ball mill, filled with 100 grams or so of Teflon coated steel shot, and then tumbled at 150 RPM for about 50 to 20 minutes. Thereafter, the powder is ready for use. To use, the powder needs to be pressed into any desirable container, tube, mold, ect., under high pressure. This composition is readily ignited by a primer, and is intended to be ignited by such an element.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***70% iron-III-oxide, 30% zirconium metal***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate incendiary compositions, especially in incendiary grenades.

05-04-023A: Easily ignitable gasless ignition composition for use in igniting incendiary compositions:
Into a suitable beaker, or similar container, equipped with a motorized stirrer, place ***75 grams of finely powdered magnesium metal***, followed by 100 milliliters of acetone. Thereafter, blend the mixture for about 10 to 15 minutes to form a uniform paste. Thereafter, add in ***35.2 grams of finely divided manganese metal*** of 200 mesh, followed by ***48 grams of divided manganese metal*** of 325 mesh, followed by ***6 grams of manganese metal*** of 50 mesh, and then continue to blend the mixture for about 10 to 15 minutes. Afterwards, add in 25 milliliters of cold water, and then add in ***23 grams of a titanium/manganese alloy*** containing about 40% titanium and 60% manganese, followed ***by 150 milligrams of finely powdered titanium metal***, and then followed by ***150 milligrams of finely powdered zirconium metal***, and then continue to blend the mixture for about 1 hour at room temperature. Thereafter, place the mixture onto a shallow pan, and allow the acetone to evaporate. Thereafter, place the remaining mixture into a desiccator filled with any strong suitable desiccant, and allow the mixture to dehydrate for about 7 days. After 7 days, the mixture needs to be pulverized by placing it into a ball mill, and tumbling for about 30 minutes in the usual manner. Thereafter, the powder is ready for use. To use, the powder needs to be pressed into any desirable container, tube, mold, ect., under high pressure. This composition is readily ignited by a primer, and is intended to be ignited by such an element.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47.5% manganese, 40% magnesium, 12.2% titanium/manganese alloy, 0.14% mixed residues, 0.08% titanium, 0.08% zirconium***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate incendiary compositions, especially for incendiary grenades, and also used to initiate other compositions such as flares, smoke compositions, and cloud seeding compositions.

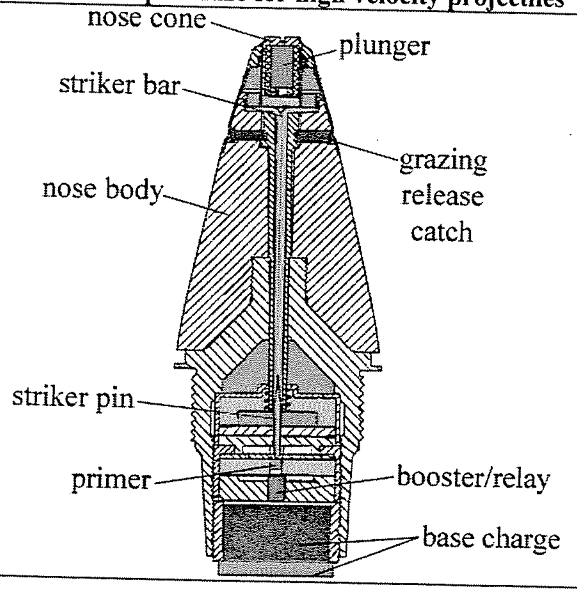
05-04-024A: Priming composition for use in percussion caps:
Into a suitable beaker or similar container, place 250 milliliters of water, and then add and dissolve ***54 grams of standard animal glue***, followed by ***54 grams of oxalic acid***. Thereafter, boil the solution, when the water begins to bubble, add in ***54 grams of antimony pentasulfide***, followed by ***54 grams of potassium chlorate***, and the continue to boil the mixture until the bulk of the water evaporates forming a paste. Thereafter, reduce the heat, and allow the pasty mass to cool to room temperature. Thereafter, place the pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Once it has thoroughly air-dried, the mixture needs to gently pulverized into loose pieces ranging from 0.5 to 2.5 millimeters in diameter and length. Note: each grain does not need to be the exact same size. To use the grains, they simply need to be packed into any desirable anvil in the usual manner.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾

Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***25% animal glue binder, 25% oxalic acid, 25% antimony sulfide, 25% potassium chlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in gun primers.

05-04-025A: Slow burning, flashless, ignition composition for tracer compositions:
Into a suitable ball mill, equipped with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***235.2 grams of barium peroxide***, followed by ***55.2 grams of antimony sulfide***, followed by ***6.6 grams of finely powdered magnesium*** of 200 mesh, and then followed by ***3 grams of finely powdered graphite***, and then gently tumble the mixture at 50 to 70 RPM for several hours. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into the rear end of the tracer cavity under identical pressure as the tracer composition was pressed, in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***78.4% barium peroxide, 18.4% antimony pentasulfude, 2.2% magnesium, 1% graphite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Tracer bullets.

05-04-026A: Ignition composition for welding compositions, specifically for tin producing welding compositions:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***180 grams of copper-I-oxide***, followed by ***152.5 grams of copper-II-oxide***, followed by ***83 grams of a finely powdered metal alloy***, commercially available, and containing 60% copper, and 40% aluminum, followed by ***41.5 grams of finely powdered aluminum*** of average mesh, and then followed by ***41.5 grams of finely grained red phosphorus***. Thereafter, add in 150 milliliters of acetone, and then blend the mixture on moderate speed until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass into a heated ball mill, filled with 200 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture for several hours at 40 to 50 Celsius to form a uniform mixture. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into pellets, discs, rods, cubes, ect., under a pressure of about 10000 psi. Can be ignited using an electric squib.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***36.1% copper-I-oxide, 30.5% copper-II-oxide, 16.6% metal alloy, 8.3% aluminum, 8.3% red phosphorus, 0.20% combined impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate welding compositions.

05-04-027A: Gasless ignition composition for use in electric blasting caps and detonators:
Into a suitable ball mill, equipped with 150 grams of Teflon coated steel shot of the usual diameter, place ***100 grams of finely powdered zirconium of average mesh***, followed by ***100 grams of lead monoxide***, and then tumble the mixture at 150 RPM for several hours. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into pellets, tablets, ect, under a pressure of 20000 psi. Note: the mixture must be pressed at 20,000 psi or firing failure will result.
Burn rate: 0.22 inches per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 7+ (based on pressing).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% zirconium, 50% lead monoxide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as a first fire igniter in electric blasting caps and detonators.

Classic impact fuze for high velocity projectiles	**Details:**
 nose cone plunger striker bar grazing release catch nose body striker pin primer booster/relay base charge	This impact fuze is armed when the projectile is fired, and is carried about by centrifugal force caused by the spinning and acceleration of the projectile at the time of firing. Upon impacting the target, the striker bar hits a striker pin, which strikes the primer. The primer sets off the booster/relay, which in turn sets off the base charge.

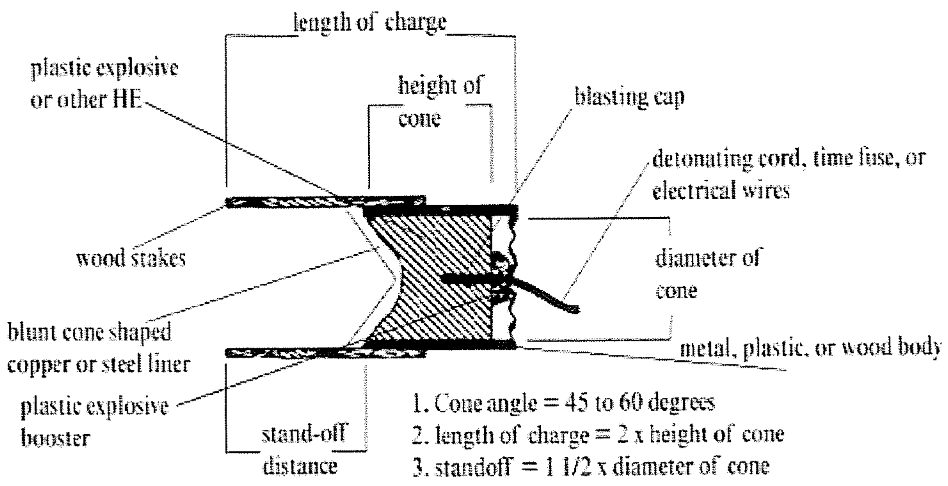
05-04-028A: Friction sensitive composition for use in primers:
Into a suitable beaker, place 200 milliliters of cold water, and then add in ***90 grams of lead styphnate***, followed by ***30 grams of lead hypophosphite***, followed by ***36 grams of lead nitrate***, followed by ***84 grams of barium nitrate***, and then followed by ***30 grams of finely powdered glass***, and ***30 grams of ground glass*** of 200 mesh. Thereafter, gently and manually blend the mixture using a plastic spatula or similar utensil for about 10 to 15 minutes to form a uniform mix. Note: during the blending the lead nitrate and lead hypophosphite will react forming an explosive addition salt. After blending the mixture for the specified amount of time, pour in 200 milliliters of 99% isopropyl alcohol, and then continue to blend the mixture for about 10 minutes. Afterwards, filter-of the insoluble mass, and then lay it out on a shallow tray or pan, and allow it to thoroughly air-dry. Once it has dried, the mass needs to be pulverized, and the various grain sizes separated using any desired mesh screens. The grains should be 0.5 to 1.5 millimeters in length. To use, the grains needs to be placed loosely into any primer/anvil.
Burn rate: Explodes.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 9+ (based on percussion).
Tendency to cake: None.
Explosive ability: Explodes.
Percentage: ***30% lead styphnate, 28% barium nitrate, 20% glass, 12% lead nitrate, 10% lead hypophosphite***
Classification: Deflagrating explosive (classified as high explosive mixture).
Use: Used in gun primers.

05-04-028B: Friction sensitive composition for use in primers (tetracene containing):
Into a suitable beaker, place 200 milliliters of cold water, and then add in ***6 grams of tetracene***, followed by ***120 grams of lead styphnate***, followed by ***90 grams of lead nitrate***, followed by ***24 grams of lead sulfocyanate***, and then followed by ***24 grams of finely powdered glass***, and ***36 grams of ground glass*** of 200 mesh. Thereafter, gently and manually blend the mixture using a plastic spatula or similar utensil for about 10 to 15 minutes to form a uniform mix. Note: during the blending the lead nitrate and lead hypophosphite will react forming an explosive addition salt. After blending the mixture for the specified amount of time, pour in 200 milliliters of 99% isopropyl alcohol, and then continue to blend the mixture for about 10 minutes. Afterwards, filter-of the insoluble mass, and then lay it out on a shallow tray or pan, and allow it to thoroughly air-dry. Once it has dried, the mass needs to be pulverized, and the various grain sizes separated using any desired mesh screens. The grains should be 0.5 to 1.5 millimeters in length. To use, the grains need to be placed loosely into any primer/anvil.
Burn rate: Explodes.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 9+ (based on percussion).
Tendency to cake: None.
Explosive ability: Explodes.

Percentage: *40% lead styphnate, 30% lead nitrate, 20% glass, 8% lead sulfocyanate, 2% tetracene*
Classification: Deflagrating explosive (classified as high explosive mixture).
Use: Used in gun primers.

05-04-029A: Conductive friction sensitive composition for use in primers (non primary explosive containing):
Into a suitable mixing bowl, equipped with motorized stirrer, place 200 milliliters of hexane, and then add in ***50 grams of lead dioxide***, followed by ***15 grams of zirconium with grain size of 5 microns***, followed by ***32.5 grams of coarse zirconium metal of 200 mesh***, followed by ***22.7 grams of zirconium metal of 325 mesh***, followed by ***6.5 grams of zirconium metal of 10 microns***, and then followed by ***70 grams of barium nitrate***. Thereafter, gently blend the mixture on low for about 15 to 20 minutes to form a uniform mix. Thereafter, place the uniform pasty dough on a shallow tray or pan, and allow to thoroughly air-dry. Once it has dried, the mass needs to be pulverized, and the various grain sizes separated using any desired mesh screens. The grains should be 0.5 to 1.5 millimeters in length. To use, the grains needs to be placed loosely into any primer/anvil.
Burn rate: Explodes.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 9+ (based on percussion).
Tendency to cake: None.
Explosive ability: Explodes.
Percentage: *38.9% zirconium, 35.5% barium nitrate, 25.4% lead dioxide, 0.2% balance*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in gun primers, or as a primer for use in blasting caps.

Improvised Shape Charge (ISC)


length of charge
plastic explosive or other HE
height of cone
blasting cap
detonating cord, time fuse, or electrical wires
wood stakes
diameter of cone
blunt cone shaped copper or steel liner
metal, plastic, or wood body
plastic explosive booster
stand-off distance
1. Cone angle = 45 to 60 degrees
2. length of charge = 2 x height of cone
3. standoff = 1 1/2 x diameter of cone

Details:

Improvised shape charges are used by soldiers in times of war when supplies are limited. They work in identical manners as regular factory built shape charges, but are not as "ideal", and are used only when needed.

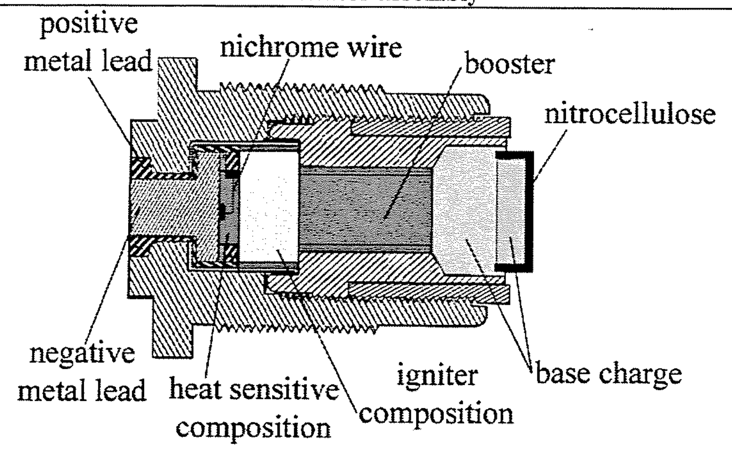
Note: the following table represents a 3.6 kilogram improvised shape charge. Second note: professionally designed shape charges would have much higher penetrating powers

Material	Penetration	Diameter of hole	Standoff
Reinforced concrete	38.1 centimeters (15 inches)	3.5 centimeters (1.4 inches)	Average
Armor plate	15.3 centimeters (6 inches)	1.9 centimeters (0.75 inches)	Average
Ground	91.5 centimeters (36 inches)	7.6 centimeters (3 inches)	At 15 inches
Soil	1.05 meters (3.5 feet)	8.9 centimeters (3.5 inches)	At `15 inches

05-04-030A: Ignition composition for use in delay trains and for generating heat for other ignition operations:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***303 grams of finely powdered aluminum*** of average mesh. Thereafter, add in ***33.5 grams of finely divided silicon*** of average mesh, followed by ***3.9 grams of finely divided titanium*** metal of average commercial availability, followed by ***149.5 grams of finely divided red iron-III-oxide***, followed by ***9.5 grams of finely divided graphite powder***. Thereafter, tumble the mixture for about 30 minutes at 500 RPM to form a uniform pulverized mass. After 30 minutes or so, the mixture is ready for use. To use, it simply needs to be moistened with a little hexane or acetone to form a mild paste, and then pressed into pellets, discs, or tablets of the desired dimensions under high pressure, and then allowed to cure for a day or two. Should be ignited using a magnesium containing ignition composition.
Burn rate: Moderate. Similar to thermite.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6 to 7 (variable).
Tendency to cake: None.
Explosive ability: Very stable.
Percentage: *60.6% aluminum, 29.9% iron-III-oxide, 6.7% silicon, 1.9% graphite, 0.78% titanium, 0.15% impurities*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in grenade fuses, and other ignition devices.

05-04-030B: Primer composition for use in detonators:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***303 grams of finely powdered aluminum*** of average mesh. Thereafter, add in ***33.5 grams of finely divided silicon*** of average mesh, followed by ***3.9 grams of finely divided titanium*** metal of average commercial availability, followed by ***149.5 grams of finely divided red iron-III-oxide***, followed by ***9.5 grams of finely divided graphite powder***. Thereafter, tumble the mixture for about 30 minutes at 500 RPM to form a uniform pulverized mass. After 30 minutes or so, add in ***600 grams of potassium chlorate***, and then continue to blend the mixture, but at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, it simply needs to be moistened with a little hexane or acetone to form a mild paste, and then pressed into pellets, discs, or tablets of the desired dimensions under high pressure, and then allowed to cure for a day or two. Can be ignited using an electric squib.
Burn rate: Above moderate
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on combustion).
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: May explode under severe conditions, but un-likely.
Percentage: *54.5% potassium chlorate, 27.5% aluminum, 13.5% iron-III-oxide, 3% silicon, 0.86% graphite, 0.35% titanium, 0.29% mixed impurities and balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in detonators.

Detonator assembly



05-04-031A: Priming composition for use in electric blasting caps or for use in electric ignition devices:
Into a suitable beaker, place ***6 grams of red phosphorus***, followed by ***12 grams of sulfur***, and then followed by ***120 grams of finely powdered silver metal***, and then heat the mixture to 98 to 100 Celsius to melt the sulfur. When the sulfur melts, rapidly blend the mixture to form a tacky-molten mass for about 10 to 15 minutes. After 10 to 15 minutes, remove the heat source, and allow the molten mass to solidify. Thereafter, into a clean separate beaker or similar container, place ***6 grams of sulfur***, followed by ***30 grams of liquid mercury***, and then blend the mixture at room temperature for about 1 hour or more. Note: heat can be applied to speed up the reaction between the sulfur and mercury. Afterwards, place into a suitable mixing bowl, equipped with motorized stirrer, the cooled solidified sulfur/phosphorus/silver mixture. Thereafter, add in ***36 grams of potassium chlorate***, followed by 300 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed until the bulk of the alcohol evaporates. When a pasty mass remains, place it onto a

shallow tray or pan, and allow it to thoroughly air-dry. Once it has, place the dried mass into a clean ball mill, filled with 200 grams of Teflon coated steel shot of 5 millimeters in diameter, and then add in the mercury/sulfur compound, and then tumble the mixture at 50 to 75 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the powder simply needs to be placed loosely into any electric blasting cap or electric ignition device. The powder explodes when contact with an electric arc, or in contact with a hot wire in an electric squib in the usual manner.
Burn rate: Very fast
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (based on electrical).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***57.1% silver metal, 17.1% potassium chlorate, 14.2% mercury metal, 8.5% sulfur, 2.8% red phosphorus, 0.30% balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in blasting caps, and in electric ignition devices.

05-04-032A: Ignition composition for flares and illumination compositions:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***425 grams of barium chromate***, followed ***50 grams of boron***, and then followed by ***25 grams of magnesium powder*** of about 200 mesh, and then tumble the mixture for about 1 hour at 150 to 200 RPM to form a uniform powder. Thereafter, the simple mixture is ready for use. To use, all you need to do is simply press the composition into pellets, tablets, or discs, of any desirable shape under a pressure of 10000 psi in the usual manner. The mixture is readily ignited by spark, flame, hot wire, or electric squib in the usual manner.
Burn rate: Above moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***85% barium chromate, 10% boron, 5% magnesium***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to ignite flare and illumination compositions.

05-04-033A: Ignition composition for incendiary agents (magnesium ophorite):
Into a suitable empty ball mill, place ***102.6 grams of fine magnesium flake of average size*** (commercially available), followed by ***197.4 grams of potassium perchlorate***, and then followed by ***6 grams of castor oil***, and then tumble the mixture thoroughly for about 1 hour at 200 to 300 RPM to form a uniform mixture. Thereafter, the mixture is ready for use. To use, all you need to do is simply press the composition into pellets, tablets, or discs, or any desirable shape under a pressure of 10000 psi in the usual manner. The mixture is readily ignited by spark, flame, hot wire, or electric squib in the usual manner.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on unconfined burn).
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None.
Explosive ability: Explodes when confined.
Percentage: ***64.3% potassium perchlorate, 33.5% magnesium flake, 1.9% castor oil, 0.3% balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to ignite incendiary agents. Note: can also be used in making firecrackers, as the mixture explodes when confined and then ignited.

05-04-033B: Ignition composition for incendiary agents (Aluminum ophorite) with increased heat of combustion:
This procedure is identical to the above process, with the exception of aluminum being used instead of magnesium. Into a suitable empty ball mill, place ***102.6 grams of fine aluminum flake of average size*** (commercially available), followed by ***197.4 grams of potassium perchlorate***, and then followed by ***6 grams of castor oil***, and then tumble the mixture thoroughly for about 1 hour at 200 to 300 RPM to form a uniform mixture. Thereafter, the mixture is ready for use. To use, all you need to do is simply press the composition into pellets, tablets, or disc, or any desirable shape under a pressure of 10000 psi in the usual manner. The mixture is readily ignited by spark, flame, hot wire, or electric squib in the usual manner.
Burn rate: Rapid.

Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on unconfined burn).
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None.
Explosive ability: Explodes when confined.
Percentage: ***64.3% potassium perchlorate, 33.5% aluminum flake, 1.9% castor oil, 0.3% balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to ignite incendiary agents. Note: can also be used in making firecrackers, as the mixture explodes when confined and then ignited.

05-04-034A: Heat resistant ignition composition with high thermal stability:
Into a suitable mixing bowl, equipped with motorized stirrer, place 200 milliliters of acetone, and then add in ***160 grams of finely divided tellurium dioxide of 4.1 microns***, followed by ***34 grams of finely powdered aluminum of 0.8 microns,*** and then followed by ***6 grams of finely divided carbon black of 0.4 microns***. Thereafter, blend the mixture for about 15 to 20 minutes to form a uniform paste. Thereafter, place the uniform pasty dough on a shallow tray or pan, and allow it to thoroughly air-dry. Once it has dried, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 300 RPM for about 1 hour. Thereafter, press the mixture into pellets, tablets, discs, ect., under the usual manner using high pressure. The mixture should be fired using a hot wire or Nichrome wire.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 (based on unconfined burn).
Ease of ignition (1 to 10): 6 to 7
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***80% tellurium dioxide, 17% aluminum, 3% carbon black***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in intercontinental missiles for withstanding the strains and heat of re-entry. Can also be used in any suitable device.

05-04-035A: Ignition composition for use in aircraft ejection seats:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***100 grams of finely divided zirconium metal***, followed by ***400 grams of strontium nitrate***, followed by ***10 grams of zinc stearate***, followed by ***30 grams of standard chlorinated rubber***, followed by ***5 grams of any desired dye compound***, and then followed by ***40 grams of calcium resinate***. Thereafter, tumble the mixture at 500 RPM for about 1 hour to form a uniform pulverized mixture. After the tumbling operation, the mixture is ready for use. To use, the mixture should be pressed into tablets or pellets under high pressure in the usual manner. The size of the tablets or pellets is dependent on the ejection seat, and its engineering. Can be fired using an electric squib in the usual fashion.
Burn rate: 200 to 300 milliseconds (may very dependent on pressure used for forming tablets/pellets).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 (based on unconfined burn).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: May explode upon ignition
Percentage: ***68.37% strontium nitrate, 17% zirconium metal, 6.8% calcium resinate, 5.1% chlorinated rubber, 1.7% zinc stearate, 0.85% dye, 0.18% balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used to initiate rocket propellants used in aircraft ejection seats.

05-04-035B: Ignition composition for use in aircraft ejection seats:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***100 grams of finely divided boron***, followed by ***400 grams of lead dioxide***, followed by ***10 grams of zinc stearate***, followed by ***30 grams of standard chlorinated rubber***, followed by ***5 grams of any desired dye compound***, and then followed by ***40 grams of strontium resinate***. Thereafter, tumble the mixture at 500 RPM for about 1 hour to form a uniform pulverized mixture. After the tumbling operation, the mixture is ready for use. To use, the mixture should be pressed into tablets or pellets under high pressure in the usual manner. The size of the tablets or pellets is dependent on the ejection seat, and its engineering. Can be fired using an electric squib in the usual fashion.
Burn rate: 200 to 300 milliseconds (may very dependent on pressure used for forming tablets/pellets).
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 8 (based on unconfined burn).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: May explode upon ignition.
Percentage: *68.37% lead dioxide, 17% boron, 6.8% strontium resinate, 5.1% chlorinated rubber, 1.7% zinc stearate, 0.85% dye, 0.18% balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to initiate rocket propellants used in aircraft ejection seats.

05-04-035C: Ignition composition for use in aircraft ejection seats:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***100 grams of finely divided magnesium metal***, followed by ***400 grams of barium nitrate***, followed by ***10 grams of zinc stearate***, followed by ***30 grams of standard chlorinated rubber***, followed by ***5 grams of toludiene red dye compound***, and then followed by ***40 grams of calcium resinate***. Thereafter, tumble the mixture at 500 RPM for about 1 hour to form a uniform pulverized mixture. After the tumbling operation, the mixture is ready for use. To use, the mixture should be pressed into tablets or pellets under high pressure in the usual manner. The size of the tablets or pellets is dependent on the ejection seat, and its engineering. Can be fired using an electric squib in the usual fashion.
Burn rate: 200 to 300 milliseconds (may very dependent on pressure used for forming tablets/pellets).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 (based on unconfined burn).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: May explode upon ignition.
Percentage: *68.37% barium nitrate, 17% magnesium, 6.8% calcium resinate, 5.1% chlorinated rubber, 1.7% zinc stearate, 0.85% toludiene red, 0.18% balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to initiate rocket propellants used in aircraft ejection seats.

05-04-036A: Priming composition for multiple uses (friction sensitive):
Into a suitable mixing drum or bowl, equipped with frictionless stir blades, place ***240 grams of potassium chlorate***, followed by ***180 grams of potassium ferrocyanide***, followed by ***80 grams of finely powdered glass***, and then add in 150 milliliters of acetone, and then blend the mixture for about 20 to 30 minutes to form a uniform paste. Thereafter, place the semi-dry material onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, the dry mass needs to be pulverized by using a mortar and pestle. Note: the dried mass should carefully be ground. The pulverized mass should then be screened to separate out the various grain sizes (primarily for use as a gun primer). If desired, the semi-pasty mass can be carefully pressed into tablets or pellets, and then allowed to dry.
Burn rate: 300 to 500 milliseconds.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on unconfined burn).
Ease of ignition (1 to 10): 9+
Tendency to cake: None.
Explosive ability: Explodes on ignition and percussion producing report.
Percentage: *48% potassium chlorate, 36% potassium ferrocyanide, 16% glass powder*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used to initiate a wide variety of pyrotechnic compositions. Can also be used as a primer for gun ammunition.

05-04-037A: Priming composition for use in electric blasting caps with good thermal stability:
Into a suitable mixing drum or bowl, equipped with frictionless stir blades, place 150 milliliters of diethyl ether, followed by ***70 grams of potassium perchlorate***, and then followed by ***384 grams of cesium decahydrodecaborate.*** Then blend the mixture for about 20 to 30 minutes to form a uniform paste. Thereafter, place the semi-dry material onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, the dry mass needs to be pulverized by using a plastic spatula or similar device to form large grains. The various grain sizes can be separated using screens or sieves in the normal manner. The desired grain sizes should be 0.5 to 2.5 millimeters in length. Thereafter, the grains are ready for use. To use, it simply needs to be placed loosely into any blasting cap. If desired, the pasty mass can be pressed into tablets or pellets in the usual manner, and then allowed to thoroughly air-dry. The grains or pellets can be ignited using a Nichrome wire or similar means.
Burn rate: 4 milliseconds based on ignition of two grains.
Impact sensitivity: drop test using 8 gram steel anvil dropped from 45 inches.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9 (based on unconfined burn).
Ease of ignition (1 to 10): 9+
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: *85% cesium decahydrodecaborate, 15% potassium perchlorate*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in electric blasting caps.

05-04-037B: Priming composition for use in electric blasting caps with good thermal stability (with increased sensitivity):
This process is identical to 05-04-037A, but the amount of potassium perchlorate is increased. Into a suitable mixing drum or bowl, equipped with frictionless stir blades, place 150 milliliters of diethyl ether, followed by ***139 grams of potassium perchlorate***, and then followed by ***384 grams of cesium decahydrodecaborate.*** Then blend the mixture for about 20 to 30 minutes to form a uniform paste. Thereafter, place the semi-dry material onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, the dry mass needs to be pulverized by using a plastic spatula or similar device to form large grains. The various grain sizes can be separated using screens or sieves in the normal manner. The desired grain sizes should be 0.5 to 2.5 millimeters in length. Thereafter, the grains are ready for use. To use, it simply needs to be placed loosely into any blasting cap. If desired, the pasty mass can be pressed into tablets or pellets in the usual manner, and then allowed to thoroughly air-dry. The grains or pellets can be ignited using a Nichrome wire or similar means.
Burn rate: 3 milliseconds based on ignition of two grains.
Impact sensitivity: drop test using 8 gram steel anvil dropped from 6 inches.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on unconfined burn).
Ease of ignition (1 to 10): 9+
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: *73% cesium decahydrodecaborate, 27% potassium perchlorate*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in electric blasting caps.

05-04-037C: Priming composition for use in electric blasting caps with good thermal stability utilizing potassium permanganate:
This process is identical to 05-04-037A, but the amount of potassium perchlorate is increased. Into a suitable mixing drum or bowl, equipped with frictionless stir blades, place 150 milliliters of diethyl ether, followed by ***474 grams of potassium permanganate***, and then followed by ***384 grams of cesium decahydrodecaborate.*** Then blend the mixture for about 20 to 30 minutes to form a uniform paste. Thereafter, place the semi-dry material onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, the dry mass needs to be pulverized by using a plastic spatula or similar device to form large grains. The various grain sizes can be separated using screens or sieves in the normal manner. The desired grain sizes should be 0.5 to 2.5 millimeters in length. Thereafter, the grains are ready for use. To use, it simply needs to be placed loosely into any blasting cap. If desired, the pasty mass can be pressed into tablets or pellets in the usual manner, and then allowed to thoroughly air-dry. The grains or pellets can be ignited using a Nichrome wire or similar means.
Burn rate: 14.8 meters per second based on ignition of two grains.
Impact sensitivity: Similar to 05-04-037B.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on unconfined burn).
Ease of ignition (1 to 10): 9+
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: *55% potassium permanganate, 45% cesium decahydrodecaborate*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in electric blasting caps.

05-04-038A: Igniter composition for use in electric ignition devices:
Into a suitable empty ball mill, place ***99 grams of finely divided titanium hydride***, followed by ***201 grams of finely divided potassium perchlorate***, and then tumble the mixture at 75 to 100 RPM for several hours to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets or pellets under high pressure in the usual manner. The mixture is readily ignited using a Nichrome wire, or other electrical means.
Burn rate: 14.8 meters per second based on ignition of two grains.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9 (based on unconfined burn).
Ease of ignition (1 to 10): 9+
Tendency to cake: None.
Explosive ability: Normal.
Percentage: *67% potassium perchlorate, 33% titanium hydride*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in electric activated ignition devices such as blasting caps, detonators, and similar devices.

05-04-039A: Thermally stable, percussion primer composition for use in primers for shell casing:
Into a suitable mixing bowl, equipped with standard motorized stirrer in the usual means, place ***123 grams of finely powdered titanium metal*** of average commercial mesh, and then followed by ***177 grams of potassium perchlorate.*** Thereafter, add in 250 milliliters of diethyl ether, and then blend the mixture until all the ether has evaporated, and a mass of grains of varying size remain. Thereafter, separate the various grains using screens or mesh sieves. The desired grain sizes should be 0.50 to 1.0 millimeters in length. Thereafter, the grains can be placed, three of four at a time depending on the size of the gun primer, loosely into any anvil cup.
Burn rate: Very fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on unconfined burn).
Ease of ignition (1 to 10): 9+
Tendency to cake: None.
Explosive ability: Explodes when struck.
Percentage: *59% potassium perchlorate, 41% titanium metal*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in gun primers.

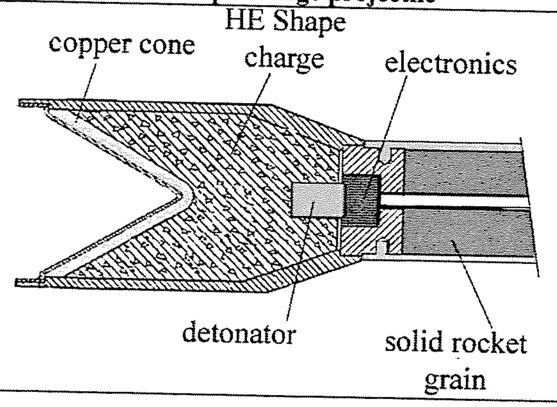
05-04-040A: Friction sensitive ignition composition for friction resistant matchhead compositions:
Into a suitable mixing bowl, equipped with standard motorized stirrer in the usual means, place 100 milliliters of warm water, and then add in ***50 grams of gum Arabic,*** and then blend the mixture for about 5 minutes. Thereafter, add in ***100 grams of amorphous phosphors,*** followed by ***finely divided black antimony trisulfide,*** and then continue to blend the mixture for about 30 minutes.. Thereafter, place the mixture onto a shallow pan or tray and allow it to thoroughly air-dry. Thereafter the mixture needs to be placed into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 50 to 75 RPM for about 15 to 30 minutes to form a uniform powder. Thereafter, the powder needs to be pressed into tablets or pellets under a pressure of 5,000 to 7,000 psi. Note: for use on matchheads, place a small amount of the pasty mass before it dries onto the tip of any desired matchhead, and allow it to dry.
Burn rate: Very fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *40% potassium chlorate, 40% antimony trisulfide, 20% gum Arabic*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate friction resistant match head compositions and for use in fuses for grenades and similar devices.

05-04-041A: Ignition composition for smoke grenades:
Into a suitable bal mill, filled with 150 grams of Teflon coated steel shot of the usual diameter and weight, place ***150 barium nitrate,*** followed by ***20 grams of silicon,*** followed by ***30 grams of tetranitrocarbazole,*** and then followed by ***45 grams of zirconium hydride.*** Thereafter, tumble the mixture for about 15 minutes at any desirable RPM. Thereafter, place this tumbled mixture into a suitable mixing drum, and then add in ***15 grams of any standard liquid epoxy resin,*** and then quickly blend the mixture thoroughly for about 5 to 10 minutes. Thereafter, cast the composition into any desirable molds, and then allow the molds to cure.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *57.6% barium nitrate, 17.3% zirconium hydride, 11.5% tetranitrocarbazole, 7.6% silicon, 5.7% epoxy resin, 0.3% mixed impurities*

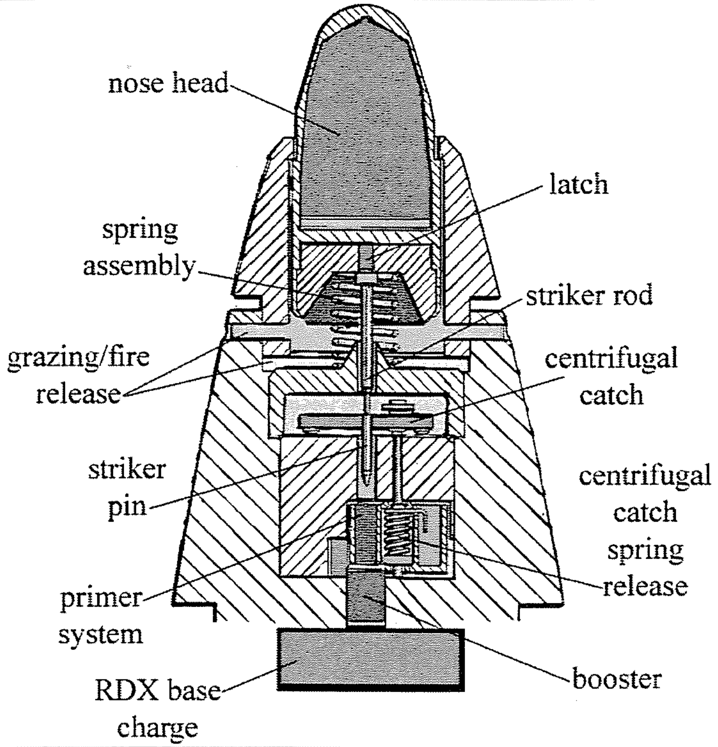
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate smoke compositions.

05-04-042A: Classic highly insensitive ignition composition for use in rapid accelerating projectiles such as tank rounds or artillery rounds:
This composition is readily prepared by simply mixing the ingredients in a ball mill, followed by pressing in the usual manner. Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter and weight, place ***300 grams of finely divided magnesium powder of the usual mesh,*** followed by ***140 grams of silicon dioxide powder,*** and then followed by ***60 grams of polybutadiene.*** Thereafter add in 150 milliliters of acetone, and then tumble the mixture at 500 RPM until all acetone has evaporated. Note: a vacuum can be applied to speed up the evaporation process. Once all the acetone has been removed, continue to mill the mixture at 250 RPM for about 1 hour to form a loose powder. Thereafter, press the mixture into tablets or pellets under 15,000 psi in the usual manner. Although the mixture is highly insensitive, it is easily ignited by flame.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: *60% magnesium, 28% silicon dioxide, 12% polybutadiene*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in tank rounds or artillery shells.

HE shape charge projectile



05-04-042B: Classic highly insensitive ignition composition for use in moderately accelerating projectiles such as mortar rounds:
This operation is practically identical to the one in 05-04-042A, but potassium perchlorate is added to increase sensitivity. Into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, place ***350 grams of finely ground magnesium powder*** of average mesh, followed by ***75 grams of potassium perchlorate,*** followed by ***37.5 grams of silicon dioxide,*** and then followed by ***37.5 grams of polybutadiene.*** Thereafter, add in 150 milliliters of hexane, and then blend the mixture until most of the hexane has evaporated. Note: a vacuum can be used to speed up the evaporation process. Once the bulk of the hexane has been removed, place the semi-pasty mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Once it is, place the dried mass into a ball mill, filled with steel shot of the usual diameter and weight, and then tumble the mixture at 250 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, rods, pellets, ect., under high pressure in the normal manner.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: *70% magnesium, 15% potassium perchlorate, 7.5% silicon dioxide, 7.5% polybutadiene*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in mortar rounds, and grenade launchers.

Classic impact fuze for mortar rounds	Details:
 nose head latch spring assembly striker rod grazing/fire release centrifugal catch striker pin centrifugal catch spring release primer system RDX base charge booster	Another typical fuze armed by the centrifugal force caused by the firing and spinning of the projectile. Upon impact, the nose head collapse rearward releasing a spring assembly that allows a firing pin to strike a primer, thereby initiating an explosive train in the usual manner.

05-04-043A: Special primer composition containing high explosives for use in shot gun primers:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***220.5 grams of lead nitrate***, followed by ***126 grams of barium hydroxide monohydrate***, followed by ***112.5 grams of antimony sulfide***, followed by ***51 grams of barium nitrate***, and then add in ***163.5 grams (dry basis) of trinitro resorcinol*** (commercially available), followed by 10 milliliters of water. Thereafter, blend the mixture for about 15 minutes. Note: during the mixing time, the temperature will rise due to the formation of lead styphnate. Thereafter, add in 10 millimeters of a 5% polyvinyl alcohol in water, followed by ***30 grams of tetracene***, followed by ***37.5 grams of PETN***, and finally followed by ***45 grams of finely powdered aluminum***, and then continue to blend the mixture for about 30 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be packed, wet, into the primer casing of any shotgun shell in the usual manner.
Burn rate: Explodes.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 9+
Tendency to cake: None.
Explosive ability: Exploded upon percussion.
Percentage: ***38% lead styphnate, 33% barium nitrate, 14% antimony sulfide, 6% aluminum, 5% PETN, 4% tetracene***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in shotgun primers.

05-04-044A: Ignition composition for use on the tips of matchsticks:
Into a suitable ball mill, place ***25 grams of pulverized soft wood charcoal***, and then add in ***5 grams of powdered nitrocellulose*** of average nitrogen content. Thereafter tumble the mixture for about 10 minutes to coat the charcoal with the nitrocellulose. Thereafter, add in ***75 grams of Prussian blue*** coloring agent, followed by ***36 grams of red phosphorus***, followed by ***500 grams of potassium chlorate***, followed by ***100 grams of pulverized glass powder***. Thereafter, dry tumble the mixture for about 50 minutes at 75 RPM. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, and then add in 150 milliliters of warm water, followed by ***15 grams of standard animal glue.*** Thereafter, blend the mixture for about 45 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the matchstick simply needs to be dipped into the mixture, and then allowed to cure in an oven or similar environment until dry and hard.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+

Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***66.13% potassium chlorate, 13.22% pulverized glass, 9.92% Prussian blue, 4.76% red phosphorus, 3.3% soft wood charcoal, 1.98% animal glue, 0.66% nitrocellulose, 0.03% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for matches.

05-04-044B: Ignition composition for use on the tips of matchsticks (modified):
Into a suitable ball mill, place ***60 grams of furnace black***, followed by ***120 grams of Prussian blue***, followed by ***50 grams of red phosphorus***, followed by ***425 grams of potassium chlorate***, followed by ***125 grams of pulverized glass powder***. Thereafter tumble the mixture for about 30 minutes. Thereafter, add in 150 milliliters of warm water, followed by ***25 grams of standard animal glue.*** Thereafter, blend the mixture for about 30 minutes to form a uniform paste. Thereafter, the mixture is ready for use. To use, the matchstick simply needs to be dipped into the mixture, and then allowed to cure in an oven or similar environment until dry and hard.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8+ (based on friction).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.79% potassium chlorate, 15.52% pulverized glass, 14.9% Prussian blue, 7.45% furnace black, 6.21% red phosphorus, 3.1% animal glue, 0.03% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for matches.

05-04-045A: Insensitive ignition composition for rockets and missiles:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***50.5 grams of potassium permanganate***, followed by ***249.5 grams of aluminum powder***. Thereafter, add in 75 milliliters of hexane or acetone, and then blend the mixture for about 20 minutes at moderate speed. Thereafter, add in ***200 grams of sodium azide***, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, place the blended mixture onto a shallow pan or tray, and allow it to thoroughly dry. Thereafter, place the dried mass into a clan ball mill, filled with 500 grams of porcelain balls, and then tumble the mixture at 75 RPM for about 3 hours to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of 10,000 psi or more.
Burn rate: Very rapid.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***49.9% aluminum powder, 40% sodium azide, 10.1% potassium permanganate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to ignite rockets and missiles. Can also be used as a gas generating composition.

05-04-045B: Insensitive ignition composition for rockets and missiles:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual size and weight, place ***50 grams of potassium permanganate***, followed by ***149.5 grams of boron powder***, and then followed by ***300.5 grams of potassium azide.*** Thereafter, spray in about 10 milliliters of hexane, and then tumble the mixture at 150 RPM for about 3 hours. Note: during the tumbling mixture, spray into the ball mill periodically, ten, 10-milliliter portions of hexane. After the tumbling process, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of 10,000 psi or more.
Burn rate: Very rapid.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***60.1% potassium azide, 29.9% boron powder, 10% potassium permanganate***
Classification: Deflagrating explosive (classified as explosive mixture).

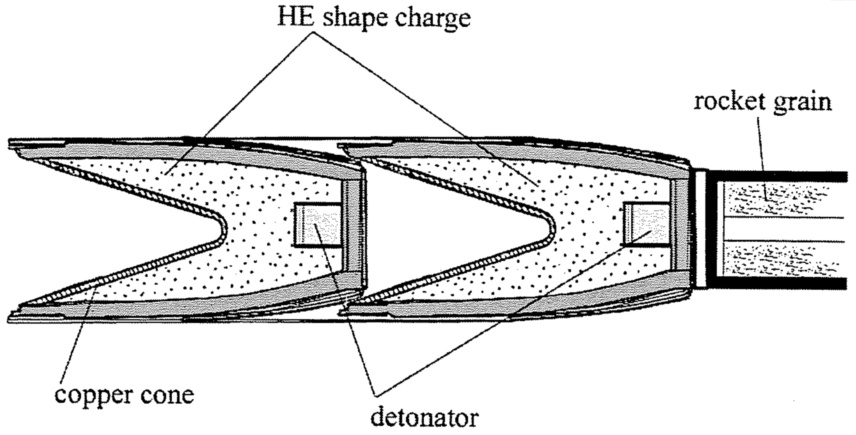
Use: Used to ignite rockets and missiles. Can also be used as a gas generating composition.

05-04-045C: Insensitive ignition composition for rockets and missiles:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***75.5 grams of potassium permanganate***, followed by ***342.5 grams of zirconium powder***. Thereafter, add in 100 milliliters of hexane or acetone, and then blend the mixture for about 20 minutes at moderate speed. Thereafter, add in ***83 grams of sodium azide***, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, place the blended mixture onto a shallow pan or tray, and allow it to thoroughly dry. Thereafter, place the dried mass into a clan ball mill, filled with 250 grams of porcelain balls, and then tumble the mixture at 125 RPM for about 3 hours to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of 10,000 psi or more.
Burn rate: Very rapid.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***68.26% zirconium powder, 16.56% sodium azide, 15.06% potassium permanganate, 0.12% mixed balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to ignite rockets and missiles. Can also be used as a gas generating composition, or for igniting incendiary compositions and flares.

05-04-046A: Insensitive priming/ignition composition for multiple uses
Into a suitable mixing bowl, equipped with motorized stirrer, place 125 milliliters of 95% ethyl alcohol, and then add in ***25 grams of potassium perchlorate***, followed by ***118.75 grams of sodium azide***, and then followed by ***356.25 grams of boron powder***. Thereafter, blend the mixture on moderate speed for about 2 hours. Thereafter, the mixture needs to be placed onto a shallow pan or tray, and then allowed to dry. Thereafter, place the dried mass into a clean ball mill, filled with 250 grams of Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 3 hours to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of 10,000 psi or more.
Burn rate: Very rapid.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***71.25% boron powder, 23.75% sodium azide, 5% potassium perchlorate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used to ignite rocket and missile propellants, or for use as a priming composition for fireworks, blasting caps, or detonators. May also be used in air-bag inflation devices, but not for use in automobiles.

05-04-046B: Insensitive priming/ignition composition for multiple uses
As in the previous example, into a suitable mixing bowl, equipped with motorized stirrer, place 125 milliliters of 95% ethyl alcohol, and then add in ***45 grams of barium nitrate***, followed by ***113.75 grams of sodium azide***, and then followed by ***341.25 grams of aluminum powder***. Thereafter, blend the mixture on moderate speed for about 2 hours. Thereafter, the mixture needs to be placed onto a shallow pan or tray, and allowed to dry. Thereafter, place the dried mass into a clean ball mill, filled with 250 grams of Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 3 hours to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of 10,000 psi or more.
Burn rate: Very rapid.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***68.25% aluminum powder, 22.75% sodium azide, 9% barium nitrate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to ignite rocket and missile propellants, or for use as a priming composition for fireworks, blasting caps, or detonators. May also be used in air-bag inflation devices, but not for use in automobiles.

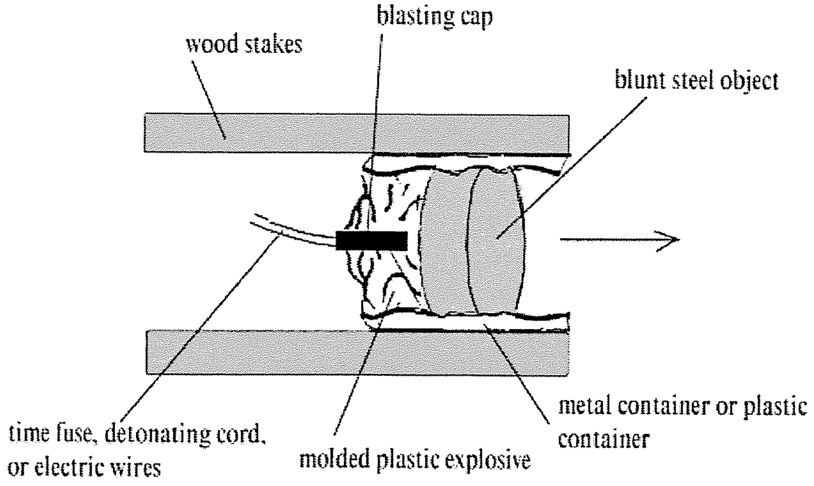
Tandem "double" shape charge



Details:
A tandem double shape charge with rocket propulsion. Double shape charges can be used for anti-tank means, or for anti-ship means. In either case, the preceding ignition composition is used to ignite the rocket.

05-04-047A: Insensitive priming composition for multiple uses
Into a suitable ball mill, filled with steel shot of the usual size and weight, place ***150 grams of potassium chlorate***, followed by ***87.5 grams of sodium azide***, and then followed by ***262.5 grams of boron powder***. Thereafter, spray in about 10 milliliters of hexane, and then tumble the mixture at 150 RPM for about 3 hours. Note: during the tumbling operation, spray into the ball mill periodically, ten, 10-milliliter portions of hexane. After the tumbling process, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of 10,000 psi or more.
Burn rate: Explosive.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.5% born powder, 30% potassium chlorate, 17.5% sodium azide***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used for priming fireworks, and for use in blasting caps, or detonators.

Platter charge primed with blasting cap utilizing priming composition


blasting cap
wood stakes
blunt steel object
time fuse, detonating cord, or electric wires
molded plastic explosive
metal container or plastic container

Details:
Platter charges are field expedient munitions utilizing a few basic elements. These elements include a blasting cap, which is inserted into a mass of plastic explosive, which is placed underneath a blunt heavy object such a steel disc or equivalent. Upon detonation of the plastic explosive, the energy released causes the blunt object to accelerate to high speed forming a lethal projectile with significant penetrating power due to its size and weight.

05-04-048A: Insensitive ignition composition for multiple uses:
Into a suitable mixing container, equipped with motorized stirrer, place 150 milliliters of acetone, followed by ***40 grams of Viton A copolymer binder***, and then stir the mixture to dissolve the binder compound. Thereafter, add in ***135 grams of boron powder***,

followed by ***274.5 grams of sodium azide***, and then followed by ***50.5 grams of potassium perchlorate***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready to be milled. To do so, place the semi dry mass into a ball mill, filed with 500 grams of Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 2 hours. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into tablets, pellets, ect., under high-pressure. The mixture can be readily ignited by any suitable means.

Burn rate: Fast.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***54.9% sodium azide, 27% boron powder, 10.1% potassium perchlorate, 8% Viton A copolymer binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in grenades and flares.

05-04-048B: Insensitive ignition composition for multiple uses:

As in the previous example, into a suitable mixing container, equipped with motorized stirrer, place 100 milliliters of acetone, followed by ***16.5 grams of "Kel-F elastomer*** (homopolymer of chlorotrifluoroethylene and vinylidene fluoride), and then stir the mixture to dissolve most of the binder compound. Thereafter, add in ***286.5 grams of potassium azide***, followed by ***143.5 grams of boron powder***, and then followed by ***53.5 grams of potassium perchlorate***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready to be milled. To do so, place the semi dry mass into a ball mill, filed with 500 grams of Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 2 hours. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into tablets, pellets, ect., under high-pressure. The mixture can be readily ignited by any suitable means.

Burn rate: Fast.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***57.3% potassium azide, 28.7% boron powder, 10.7% potassium perchlorate, 3.3% Kel-F elastomer***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in grenades and flares.

05-04-048C: Insensitive ignition composition for multiple uses:

As in the previous example, into a suitable mixing container, equipped with motorized stirrer, place 200 milliliters of acetone, followed by ***96 grams of "Kel-F" wax*** (homopolymer of chlorotrifluoroethylene), followed by ***20 grams of Viton A copolymer binder***, and then stir the mixture to dissolve the binder compounds. Thereafter, add in ***192 grams of aluminum powder***, followed by ***192 grams of sodium azide***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready to be milled. To do so, place the semi dry mass into a ball mill, filed with 500 grams of y Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 2 hours. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into tablets, pellets, ect., under high-pressure. The mixture can be readily ignited by any suitable means.

Burn rate: Fast.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***38.4% sodium azide, 38.4% aluminum powder, 19.2% Kel-F copolymer binder, 4% Viton A binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in grenades and flares.

05-04-049A: Friction sensitive ignition composition for electric matches, matchsticks, and friction initiated devices:

Into a suitable ball mill, place ***100 gram of red phosphorus***, followed by ***20 grams of iron sulfide***. Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, into a clean beaker or suitable container, equipped with motorized stirrer, place 80 grams of sulfur monochloride liquid, and then heat this liquid to about 65 Celsius. Thereafter, add in the red phosphorus/lead sulfide mixture,

and then blend the entire mixture for about 1 hour at 65 Celsius. Note: a violent reaction will ensue, so use proper ventilation and keep clear of the reaction mixture as it may ignite into flames. After the initial reaction, filter the mixture to recover the insoluble materials, and then vacuum dry or air-dry these filtered-off materials. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 150 milliliters of hexane, followed by ***35 grams of powdered glass***, followed by ***15 grams of animal glue***, and then followed by ***5 grams of lamp black***. Thereafter, blend the mixture until the bulk of the hexane evaporates. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure, and then cured in an oven at ordinary temperatures.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***68.08% phosphorus sulfur compound, 14.89% powdered glass 8.5% iron sulfide, 6.38% animal glue, 2.12% lap black, 0.03% balance,***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in electric matches, and for friction activated devices.

05-04-050A: Non-friction sensitive ignition composition for various operations:

Into a suitable ball mill, place ***100 gram of standard vegetable charcoal***, followed by ***400 grams of food grade starch***, followed by ***30 grams of tragacanth gum***, and then followed by ***100 grams of pulverized sawdust***. Thereafter, add in 500 grams of Teflon coated steel shot, and then tumble the mixture at 300 RPM for about 2 hours. In the meantime, into a separate ball mill, filled with 300 grams of Teflon coated steel shot, place ***350 grams of potassium chlorate***, followed by ***20 grams of potassium dichromate***, and then tumble the mixture at 150 RPM for about 2 hours. After both 2 hour tumbling periods, place both tumbled mixtures into a suitable mixing bowl, equipped with motorized stirrer, and then add in 250 milliliters of hexane or 95% ethyl alcohol and then blend the mixture for about 15 to 20 minutes at moderate speed in the usual manner. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure, and then cured in an oven at ordinary temperatures.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***40% food starch, 35% potassium chlorate, 10% vegetable charcoal, 10% pulverized sawdust, 3% tragacanth gum, 2% potassium dichromate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for non-friction-activated devices.

05-04-050B: Moderate friction sensitive ignition composition for matchsticks, and other operations:

Into a suitable ball mill, place ***100 gram of glass powder***, followed by ***80 grams of gum Arabic,*** and then followed by ***300 grams of antimony trisulfide***. Thereafter, add in 150 grams of Teflon coated steel shot, and then tumble the mixture at 75 RPM for about 2 hours. In the meantime, into a separate ball mill, filled with 200 grams of Teflon coated steel shot, place ***50 grams of lead dioxide***, followed by ***20 grams of potassium dichromate***, and then followed by ***450 grams of potassium chlorate***, and then tumble the mixture at 150 RPM for about 2 hours. After both 2 hour tumbling periods, place both tumbled mixtures into a suitable mixing bowl, equipped with motorized stirrer, and then add in 250 milliliters of hexane or 95% ethyl alcohol and then blend the mixture for about 15 to 20 minutes at moderate speed in the usual manner. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure, and then cured in an oven at ordinary temperatures.

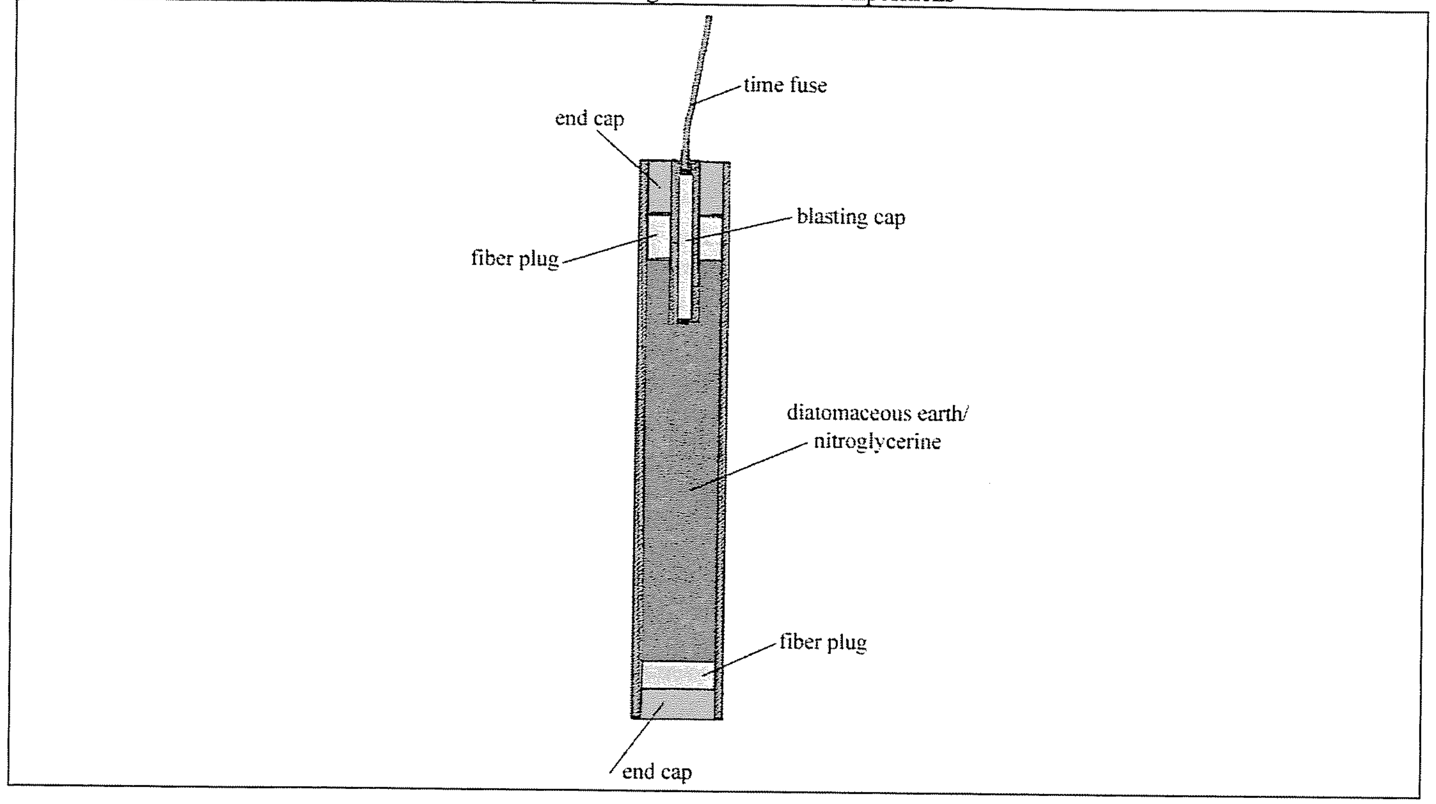
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***45% potassium chlorate, 30% antimony trisulfide, 10% glass powder, 8% gum Arabic, 5% lead dioxide, 2% potassium dichromate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for medium tolerance friction-activated devices.

05-04-050C: Rough friction producing ignition surface for use in combination with matches and other friction sensitive ignition compositions:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***150 grams of standard animal glue***, and then followed by 200 milliliters of warm water. Thereafter, blend the mixture on moderate speed for about 30 minutes to form a uniform dispersion. Thereafter, add in ***350 grams of glass powder***, followed by ***300 grams of red phosphorus***, followed by ***180 grams of antimony trisulfide***, and then followed by ***20 grams of potassium dichromate***. Thereafter, add in 150 milliliters of acetone, and then blend the mixture on moderate speed for about 50 minutes under mild vacuum to remove some of the water and acetone. Thereafter, the mixture is ready for use. To use, the wet mass needs to be smeared or layered over a piece of cardboard, metal, paper, ect., to form a thin layer. The resulting devices then need to be cured in an oven at ordinary temperature until dry and hard.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***35% glass powder, 30% red phosphorus, 18% antimony trisulfide, 15% animal glue, 2% potassium dichromate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to form a rough ignition surface whereby friction sensitive mixtures can be ignited there from.

05-04-051A: Ignition composition for initiating thermite and other incendiary compositions:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***50 grams of aluminum powder***, followed by ***75 grams of zinc phosphide***, and then followed by ***425 grams of potassium dichromate***. Thereafter, spray in about 75 milliliters of hexane, and then tumble the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of about 10,000 psi.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***77.27% potassium dichromate, 13.63% zinc phosphide, 9.09% aluminum powder, 0.01% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to ignite incendiary compositions.

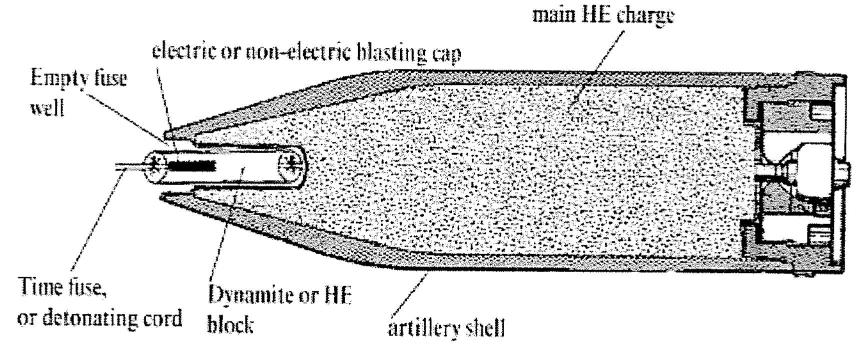
05-04-052A: Priming composition for use in blasting caps:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***150 grams of finely divided mossy zinc***, followed by ***350 grams of copper powder***, followed by ***125 grams of zinc phosphide***, and then followed by ***375 grams of potassium dichromate***. Thereafter add in 350 milliliters 95% ethyl alcohol, and then blend the mixture on moderate speed for about 45 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dry mass into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, and then tumble the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, discs, rods, ect., under a pressure of about 10,000 psi.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***37.5% potassium dichromate, 35% copper powder, 15% mossy zinc, 12.5% zinc phosphide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as a priming composition for use in blasting caps and detonators.

Commercial Dynamite



05-04-053A: Priming composition for use in small arms primers:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***125 grams of red phosphorus***, followed by ***125 grams of lead dioxide***, followed by ***350 grams of barium nitrate***, and then followed by ***100 grams of zirconium metal powder***. Thereafter add in 450 milliliters acetone, and then blend the mixture on low speed until all the acetone evaporates. Now, during the mixing process, as the acetone evaporates, the mixture will form grains of various sizes. Once the acetone has evaporated, the mixture will be composed of loose grains or chunks of varying sizes. Thereafter, sieve the grains to collect the various grain sizes. Thereafter, the grains sizes are ready for use. To use, the grains simply need to be placed into any desired gun primer in the usual manner. The size of the gun primers dictates the size of the priming grains that should be used. For example, 0.2 to 1 millimeters grains should be used in small caliber ammunition, and larger grains of 1 to 1.5 millimeter grains can be used in larger ammunition, ect., ect.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on percussion).
Tendency to cake: None.
Explosive ability: Explodes upon strong percussion.
Percentage: ***50% barium nitrate, 17.85% red phosphorus, 17.85% lead dioxide, 14.28% zirconium metal powder, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used as a priming composition for use in small arms ammunition. Should not be used in rim fire casings.

Method of priming an outdated artillery shell to form an IED (US ARMY)


main HE charge
electric or non-electric blasting cap
Empty fuse well
Time fuse, or detonating cord
Dynamite or HE block
artillery shell

05-04-053B: Priming composition for use in small arms primers:

Into a suitable mixing bowl, equipped with motorized stirrer, place ***125 grams of red phosphorus***, followed by ***125 grams of antimony trisulfide***, and then followed by ***350 grams of barium nitrate***. Thereafter add in 250 milliliters acetone, and then blend the mixture on low speed until all the acetone evaporates. Now, during the mixing process, as the acetone evaporates, the mixture will form grains of various sizes. Once the acetone has evaporated, the mixture will be composed of loose grains or chunks of varying sizes. Thereafter, sieve the grains to collect the various grain sizes. Thereafter, the grain sizes are ready for use. To use, the grains simply need to be placed into any desired gun primer in the usual manner. The size of the gun primers dictates the size of the priming grains that should be used. For example, 0.2 to 1 millimeters grains should be used in small caliber ammunition, and larger grains of 1 to 1.5 millimeter grains can be used in larger ammunition, ect., ect.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9 (based on percussion).

Tendency to cake: None.

Explosive ability: Explodes upon strong percussion.

Percentage: ***58.33% barium nitrate, 20.83% red phosphorus, 20.83% antimony trisulfide, 0.01% residual balance***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used as a priming composition for use in small arms ammunition. Should not be used in rim fire casings.

05-04-054A: Priming composition for use in small arms primers:

Into a suitable beaker or similar container, place ***100 grams of potassium chlorate***, followed by ***100 grams of red phosphorus***, and then followed by 450 milliliters of hot water (the water should be heated to about 90 Celsius prior to adding). Thereafter, gently blend the mixture for about 10 minutes. Thereafter, add in ***400 grams of lead plumbate***, and then continue to blend the mixture for about 45 minutes at 90 Celsius. Make sure to keep the water mixture heated to around 90 Celsius. Thereafter, remove the heat source, and then pour the entire mixture onto a shallow pan or tray, and allow it to thoroughly air dir. Once it has, the mixture needs to be scraped up, and placed into a suitable mixing bowl, equipped with motorized stirrer. Thereafter, add in 500 milliliters of acetone, followed by ***5 grams of powdered gum tragacanth***, followed by ***5 grams of gum Arabic***, and then followed by ***75 grams of powdered glass***. Thereafter, blend the mixture on moderate speed until the solvent evaporates. Note: during the blending operation, and as the solvent evaporates, the mixture will form grains of various sizes. Once the solvent has evaporated, the mixture will be granulated into various grains sizes, which should then be separated using sieves or screens of the desired mesh. Once the grains have been separated into their various sizes, they can be packed directly into the desired primers.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9 (based on percussion).

Tendency to cake: None.

Explosive ability: Explodes upon strong percussion.

Percentage: ***72.99% red phosphorus/lead plumbate addition salt, 14.59% potassium chlorate, 10.94% powdered glass, 0.72% gum tragacanth, 0.72% gum Arabic, 0.04% balance***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used as a priming composition for use in small arms ammunition, specifically for use in rim fire cartridges.

05-04-055A: Priming composition for use in small arms primers:

Into a suitable beaker or similar container, place ***200 grams of nitrocellulose***, and then followed by ***50 grams of red phosphorus***. Thereafter, add in 150 milliliters of acetone, and then followed by 75 milliliters of ether. Thereafter, blend the mixture for about 30 minuets at room temperature. Now, place the mixture onto a shallow tray or pan, and allow it to thoroughly air-dry. Note: a vacuum system can be used to collect the solvents. Thereafter, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated aluminum shot, and then tumble the mixture at 75 RPM for about 3 hours. Thereafter, place the pulverized nitrocellulose/red phosphorus mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***375 grams of potassium chlorate***, and then followed by ***370 grams of black antimony sulfide***. Thereafter, add in 500 milliliters of acetone, and then blend the mixture until all the solvent evaporates. Note: as the solvent evaporates, various grain sizes will be obtained. These grain sizes can then be separated into their various sizes using screens under the usual manner.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9

Ease of ignition (1 to 10): 9 (based on percussion).

Tendency to cake: None.

Explosive ability: Explodes upon strong percussion.

Percentage: ***37.68% potassium chlorate, 37.18% black antimony sulfide, 20.1% nitrocellulose, 5.02% red phosphorus, 0.02% mixed residual balance***

Classification: Deflagrating explosive (classified as explosive mixture).

Use: Used as a priming composition for use in small arms ammunition.

05-04-056A: Gasless ignition composition for smoke pots and smoke grenades:

Into a suitable ball mill or vertical mixer, filled with Teflon coated steel shot, place ***18 grams of celluloid product***, followed by ***533 grams of red lead***, followed by ***112 grams of finely divided manganese powder***, and then followed by ***337 grams of finely divided silicon***. Thereafter, spray in about 100 milliliters of hexane over a period of about 1 hour while tumbling the mixture at 150 RPM. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, rods, discs, ect, under high pressure in the usual manner.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 6

Ease of ignition (1 to 10): 7+

Tendency to cake: None.

Explosive ability: **Stable.**

Percentage: ***53.3% red lead, 33.7% silicon, 11.2% manganese, 1.8% celluloid***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used to initiate smoke pots, smoke grenades, and other smoke generating devices.

05-04-056B: Gasless ignition composition for smoke pots and smoke grenades:

Into a suitable ball mill or vertical mixer, filled with Teflon coated steel shot, place ***18 grams of celluloid product***, followed by ***769 grams of litharge***, followed by ***193 grams of finely divided silicon***, followed by ***15 grams of fullers earth***, and then followed by ***5 grams of finely divided graphite***. Thereafter, spray in about 100 milliliters of hexane over a period of about 1 hour while tumbling the mixture at 150 RPM. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, rods, discs, ect, under high pressure in the usual manner.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 6

Ease of ignition (1 to 10): 7+

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***76.9% litharge, 19.3% silicon, 1.8% celluloid, 1.5% fullers earth, 0.5% graphite***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used to initiate smoke pots, smoke grenades, and other smoke generating devices.

05-04-056C: Gasless ignition composition for smoke pots and smoke grenades:

Into a suitable ball mill or vertical mixer, filled with Teflon coated steel shot, place ***18 grams of celluloid product***, followed by ***590 grams of lead-II-chromate***, followed by ***196 grams of finely divided silicon***, and then followed by ***196 grams of finely divided magnesium powder***. Thereafter, spray in about 100 milliliters of hexane over a period of about 1 hour while tumbling the mixture at 150 RPM. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, rods, discs, ect, under high pressure in the usual manner.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 6

Ease of ignition (1 to 10): 7+

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***59% lead chromate, 19.6% silicon, 19.6% magnesium powder, 1.8% celluloid***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used to initiate smoke pots, smoke grenades, and other smoke generating devices.

05-04-057A: Ignition composition for tracer compositions (with ADN addictive):

Into a suitable mixing drum, equipped with motorized stirrer, place ***50 grams of nitrocellulose***, followed by ***500 grams of barium nitrate***, followed by ***100 grams of ADN***, followed by ***150 grams of zirconium hydride***, followed by ***200 grams of finely divided silicon***, and then followed by 250 milliliters of ether. Thereafter, blend the mixture for about 45 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, it needs to be pressed, in small amounts, over the desired tracer composition in the rear of the bullet or projectile, and then allowed to cure at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 8 (based on combustion of propellant gas).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50% barium nitrate, 20% silicon, 15% zirconium hydride, 10% ADN, 5% nitrocellulose***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to initiate tracer compositions for use in ammunition.

05-04-058A: Priming composition for use in blasting caps:
Into a suitable mixing drum, equipped with motorized stirrer, place ***200 grams of finely divided alloy powder*** (43% titanium, 47% lead, and 10% tin), followed by ***100 grams of barium nitrate***, followed by ***50 grams of lead dioxide***, and then followed by ***100 grams of coarse zirconium metal.*** Thereafter, add in 150 milliliters of ether or hexane, and then blend the mixture for about 45 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., under moderate pressure, and then cure at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***44.44% special metal alloy, 22.22% barium nitrate, 22.22% coarse zirconium metal, 11.11% lead dioxide, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in non-electric blasting caps to be initiated by black powder time fuse. Can also be used as a primer for small arms ammunition.

05-04-058B: Priming composition for use in blasting caps:
Into a suitable mixing drum, equipped with motorized stirrer, place ***250 grams of finely divided alloy powder*** (25% titanium, 25% zirconium, and 50% tin), followed by ***100 grams of barium nitrate***, followed by ***50 grams of lead dioxide***, followed by ***80 grams of zirconium powder***, and then followed by ***20 grams of antimony trisulfide.*** Thereafter, add in 125 milliliters of ether or hexane, and then blend the mixture for about 45 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., under moderate pressure, and then cure at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50% special metal alloy, 20% barium nitrate, 16% zirconium powder, 10% lead dioxide, 4% antimony trisulfide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in non-electric blasting caps to be initiated by black powder time fuse. Can also be used as a primer for small arms ammunition.

05-04-058C: Priming composition for use in blasting caps:
Into a suitable empty ball mill or vertical mixer, place ***230 grams of special metal alloy*** (35% zirconium, 35% lead, 27% manganese, and 3% antimony), followed by ***100 grams of coarse zirconium metal***, followed by ***50 grams of lead dioxide***, and then followed by ***20 grams of antimony trisulfide.*** Thereafter, tumble the mixture at 75 RPM for about 1 hour. Note: during the tumbling process, spray into the mixture 50 milliliters of hexane during the tumble process. Thereafter, place this mixture into a suitable mixing drum, equipped with motorized stirrer, and then add in ***100 grams of barium nitrate.*** Thereafter, add in 125 milliliters of ether or hexane, and then blend the mixture for about 45 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., under moderate pressure, and then cure at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***46% special metal alloy, 20% barium nitrate, 20% zirconium metal, 10% lead dioxide, 4% antimony trisulfide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in non-electric blasting caps to be initiated by black powder time fuse. Can also be used as a primer for small arms ammunition.

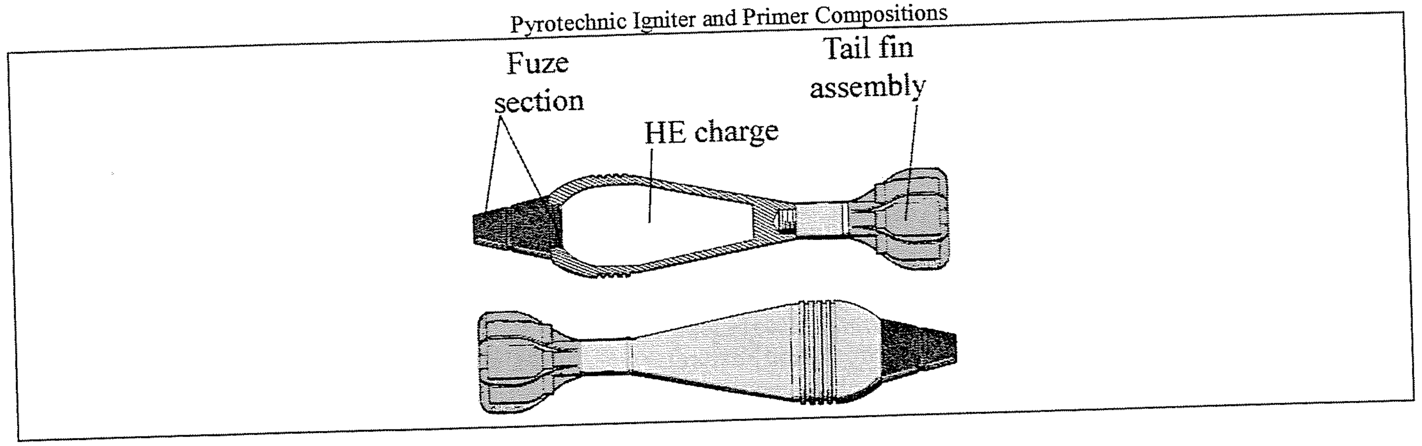
05-04-058D: Priming composition for use in blasting caps:
Into a suitable empty ball mill or vertical mixer, place ***230 grams of special metal alloy*** (8% zirconium, 62% manganese, and 30% antimony), followed by ***50 grams of lead dioxide,*** followed by ***100 grams of zirconium metal powder***, and then followed by ***20 grams of antimony trisulfide.*** Thereafter, tumble the mixture at 75 RPM for about 1 hour. Note: during the tumbling process, spray into the mixture 50 milliliters of hexane during the tumble process. Thereafter, place this mixture into a suitable mixing drum, equipped with motorized stirrer, and then add in ***100 grams of barium nitrate.*** Thereafter, add in 125 milliliters of ether or hexane, and then blend the mixture for about 45 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., under moderate pressure, and then cure at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***46% special metal alloy, 20% barium nitrate, 20% zirconium metal, 10% lead dioxide, 4% antimony trisulfide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in non-electric blasting caps to be initiated by black powder time fuse. Can also be used as a primer for small arms ammunition.

05-04-059A: Igniter composition for tracer compositions:
Into a suitable empty ball mill or vertical mixer, place ***405 grams of strontium peroxide***, followed by ***20.5 grams of barium peroxide,*** and then followed by ***20.5 grams of lead peroxide.*** Thereafter, tumble the mixture at 175 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing drum, equipped with motorized stirrer, and then add in ***40 grams of calcium resinate,*** followed by ***55 grams of calcium silicide***, and then followed by 125 milliliters of ether or hexane. Thereafter, blend the mixture for about 45 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into the end of the tracer cavity after the tracer composition has been pressed in and cured, and then cured itself in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): Not calculated.
Ease of ignition (1 to 10): 8 (based on heat of propellant grains).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***74.86% strontium peroxide, 10.16% calcium silicide, 7.39% calcium resinate, 3.78% barium peroxide, 3.78% lead peroxide. 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in non-electric blasting caps to be initiated by black powder time fuse. Can also be used as a primer for small arms ammunition.

Typical mortar shell design



05-04-060A: Specialty high-temperature igniter composition for use in electric "squibs":
Into a suitable empty ball mill or vertical mixer, place ***343 grams of finely ground hafnium metal***, and then followed by ***133.5 grams of potassium perchlorate***. Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl or drum, equipped with motorized stirrer in the usual manner, and then add in ***23.5 grams of nylon binder,*** and then followed by 150 milliliters of methanol. Thereafter, blend the mixture on moderate speed for about 15 to 35 minutes. Thereafter, place the mixture into a vacuum apparatus, and remove the methanol under vacuum. Thereafter, the remaining mass needs to be placed into a suitable ball mill, filled with Teflon coated steel shot, and then pulverized into a fine powder. Thereafter, the mixture is ready for use. To use, the powdered mixture needs to be pressed into tablets, pellets, ect, under high pressure in the usual manner.
Burn rate: Average.
Flame temperate: 4500 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***68.6% ground hafnium metal, 26.7% potassium perchlorate, 4.7% nylon binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in electric squibs.

05-04-061A: Classic lead nitrate priming composition for rim-fire ammunition:
Into a suitable ball mill, or vertical mixer, place ***150 grams of potassium chlorate***, followed by ***60 grams of lead nitrate anhydrous***, followed by ***165 grams of lead thiocyanate***, and then followed by ***125 grams of glass powder***. Thereafter, tumble or rotate the mixture at 50 RPM for 2 hours at room temperature. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 250 milliliters of hexane or acetone. Thereafter, blend the mixture on moderate speed until the solvent evaporates. Note: during the blending operation, and as the solvent evaporates, the mixture will form grains of various sizes. Once the solvent has evaporated, the mixture will be granulated into various grains sizes, which should then be separated using sieves or screens of the desired mesh. Once the grains have been separated into their various sizes, they can be packed directly into the desired primers. Note: if desired, the dry mixture can be pulverized into a fine powder, moistened with a little solvent, and then coated onto small sand grains. These sand grains can be used in fireworks for "poppers", or directly in primers.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***33% lead thiocyanate, 30% potassium chlorate, 25% glass powder, 12% lead nitrate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in primers for small arms weapons, fireworks, or any other desired application.

05-04-062A: Priming composition for use in non-electric blasting caps:
Into a suitable empty ball mill, or vertical mixer, place ***150 grams of potassium chlorate***, and then followed by ***200 grams of nitrocellulose.*** Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, and then add in ***150 grams of potassium ferrocyanide***, and then followed by 100 milliliters of hexane. Thereafter, blend the mixture on moderate speed for about 45 minutes. Now, place the blended mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a ball mill, filled with 250 grams of Teflon coated steel shot, and then tumble the mixture at 50 RPM for about 2 hours at room temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be placed loosely into any desired blasting cap or detonator in the appropriate place in the usual manner.

Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes upon ignition.
Percentage: ***40% nitrocellulose, 30% potassium chlorate, 30% potassium ferrocyanide***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in blasting caps and detonators as a first fire ignition charge initiated by a black powder time fuse.

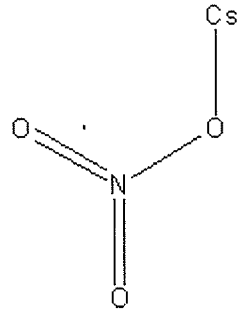
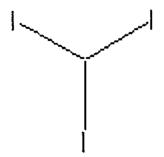
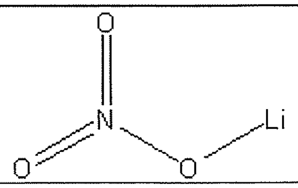
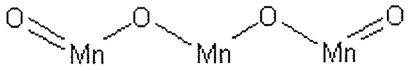
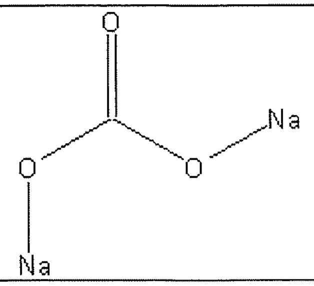
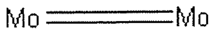
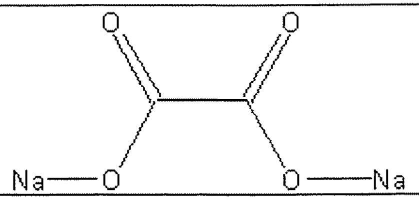
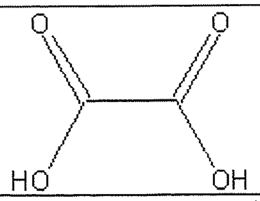
05-04-063A: Specialty priming composition for use ammunition primers:
Into a suitable empty ball mill, or vertical mixer, place ***70 grams of calcium hypophosphite***, and then followed by ***140 grams of lead nitrate.*** Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable beaker or similar container, equipped with heavy-duty stir bar, and then add in 50 milliliters of cold water. Thereafter, blend the mixture on moderate speeds for about 45 minutes. Note: the mixture must be consistently blended to prevent setting of the mass to a rock hard mass. After the blending operation, the mixture should be placed onto a shallow pan or tray, and then allowed to thoroughly air-dry. Once the mass has air-dried, it needs to be manually pulverized using a spatula or similar instrument. Note: be careful when pulverizing the mass. Now, into a suitable mixing drum, equipped with motorized stirrer, place 500 milliliters of a 50:50 mixture of ethyl alcohol and water, followed by ***100 grams of lead sulfocyante***, followed by ***200 grams of powdered glass***, followed by ***160 grams of barium nitrate***, and then followed by ***330 grams of lead styphnate***. Thereafter, blend the mixture on slow speed for about 50 minutes. Thereafter, place the mixture into any desired press machine, and press-out the liquid. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be placed onto a shallow tray or pan, and allowed to thoroughly air-dry. Once it has, the dried mass needs to be manually pulverized, and the resulting mixture separated into its various grain sizes using screens or sieves in the usual manner.
Burn rate: Explodes.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes upon ignition.
Percentage: ***33% lead styphnate, 21% lead calcium hypophosphate/nitrate complex salt, 20% powdered glass, 16% barium nitrate, 10% lead sulfocyanate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in ammunition primers for small arms ammunition, and can be used in electric primers for tank ammunition.

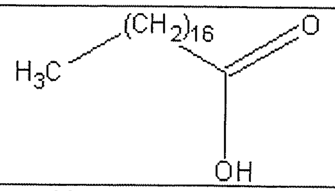
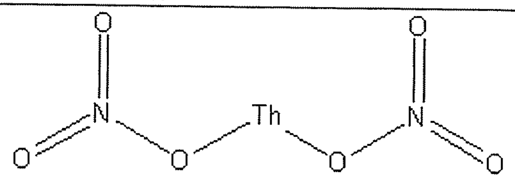
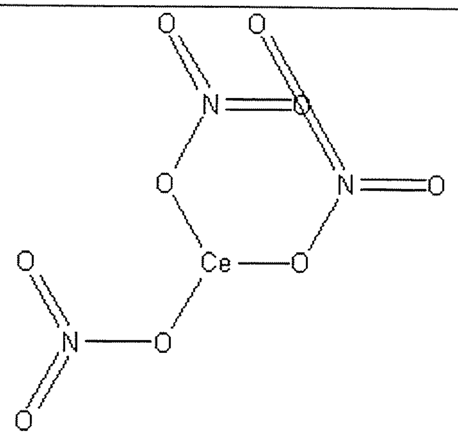
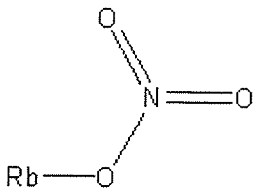
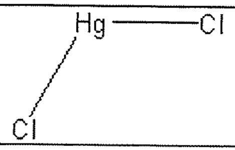
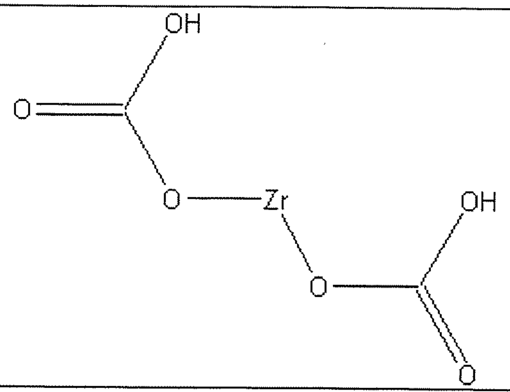
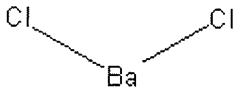
05-04-064A: Starter composition for ignition of smoke compositions:
Into a suitable empty ball mill, or vertical mixer, place ***401 grams of red lead tetraoxide***, and then followed by ***80.5 grams of finely ground silicon powder.*** Thereafter, tumble the mixture at 200 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing drum, equipped with motorized stirrer, and then add in ***20.2 grams of a binder mixture*** composed of 79% vinylidene and 21% hexafluoropropylene. Thereafter, blend the mixture on slow speed for about 15 minutes in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, rods, pellets, ect., under moderate pressure, and then cured in an oven under moderate temperature.
Burn rate: Explodes.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable
Percentage: ***79.92% lead tetraoxide, 16.04% ground silicon powder, 4.02% binder, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Widely used starter composition used to ignite smoke compositions.

Section 5: Illumination/Flare and Signaling Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	2. Sulfur (see Black Powder)
3. Charcoal (see Black Powder)	4. Sugar Carbon (see Modified Black Powder)
5. Barium Chromate (see Modified Black Powder)	6. Potassium Perchlorate (see Modified Black Powder)
7. Potassium Dichromate (see Modified Black Powder)	8. Ammonium Bisulfide (see Modified Black Powder)
9. Potassium chlorate (see Modified Black Powder)	10. Carbon Disulfide (see Modified Black Powder)
11. Nitrocellulose (see Modified Black Powder)	12. Lead Tetraoxide (see Modified Black Powder)
13. Diphenylamine (see Modified Black Powder)	14. Titanium Dioxide (see Modified Black Powder)
15. Manganese Dioxide (see Modified Black Powder)	16. Sodium Benzoate (see Modified Black Powder)
17. Ammonium Nitrate (see Modified Black Powder)	18. Calcium Carbonate (see Modified Black Powder)
19. Sodium Nitrate (see Modified Black Powder)	20. Urea (see Modified Black Powder)
21. Lead Nitrate (see Modified Black Powder)	22. Nitro Starch (see Modified Black Powder)
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	40. PVC (see Ammonium Perchlorate Rocket Propellants)
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)
45. ADN (see ADN Rocket Propellants)	46. Urea Nitrate (see ADN Rocket Propellants)
47. Silicon Powder (see ADN Rocket Propellants)	48. Hexamine (see ADN Rocket Propellants)
49. Boron powder (see ADN Rocket Propellants)	50. Sodium hypophosphite (see ADN Rocket Propellants)
51. KDN (see ADN Rocket Propellants)	52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)
53. TNT (see Ammonium Nitrate Rocket Propellants)	54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	76. Lead Stearate (see Nitrocellulose Gun Propellants)
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	78. Sugar (sucrose) (see Miscellaneous Gun Propellants)
79. Sodium Propionate (see Miscellaneous Gun Propellants)	80. Picric Acid (see Miscellaneous Gun Propellants)
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	82. Ammonium Picrate (see Miscellaneous Gun Propellants)
83. Barium Peroxide (see Bullet Tracer Compositions)	84. Magnesium Carbonate (see Bullet Tracer Compositions)
85. Strontium Peroxide (see Bullet Tracer Compositions)	86. Strontium Nitrate (see Bullet Tracer Compositions)
87. Cupric chloride (see Bullet Tracer Compositions)	88. Hexachlorobenzene (see Bullet Tracer Compositions)
89. Strontium oxalate (see Bullet Tracer Compositions)	90. Mercury-I-Chloride (see Bullet Tracer Compositions)
91. Zinc Oxalate (see Bullet Tracer Compositions)	92. Zinc Chloride (see Bullet Tracer Compositions)
93. Uranium (see Bullet Tracer Compositions)	94. Zirconium nitrate (see Bullet Tracer Compositions)
95. Yttrium Nitrate (see Bullet Tracer Compositions)	96. Yttrium Oxide (see Bullet Tracer Compositions)
97. Zirconium Oxide (see Bullet Tracer Compositions)	98. Cerium Oxide (see Bullet Tracer Compositions)
99. Hexachloroethane (see Bullet Tracer Compositions)	100. Antimony trisulfide (see Bullet Tracer Compositions)
101. Anthracene (see Bullet Tracer Compositions)	102. Phosphorus Sesquisulphide (see Match Compositions)
103. Boric acid (see Match Compositions)	104. Aluminum Hydroxide (see Match Compositions)
105. Antimony Pentasulfide (see Match Compositions)	106. Glucose (see Match Compositions)
107. Sodium Hydroxide (see Match Compositions)	108. Lead Hypophosphite (see Match Compositions)
109. Calcium Sulfate (see Match Compositions)	110. Ammonium Chloride (see Smoke Generating Compositions)
111. Manganese (see Smoke Generating Compositions)	112. Lactose (see Smoke Generating Compositions)
113. Propylene Glycol (see Smoke Generating Compositions)	114. Glycerol (see Smoke Generating Compositions)
115. Potassium Chloride (see Smoke Generating Compositions)	116. Potassium Bicarbonate (see Smoke Generating Compositions)
117. Dicyanodiamide (see Smoke Generating Compositions)	118. Naphthalene (see Smoke Generating Compositions)
119. Thiourea (see Smoke Generating Compositions)	120. Phthalic Anhydride (see Smoke Generating Compositions)
122. Cadmium powder (see Smoke Generating Compositions)	123. Cadmium Sulfide (see Smoke Generating Compositions)
124. Melamine (see Smoke Generating Compositions)	125. Malic Acid (see Smoke Generating Compositions)
126. Calcium Lactate (see Smoke Generating Compositions)	127. Metallic Sodium (see Smoke Generating Compositions)
128. Bismuth Tetraoxide (see Smoke Generating Compositions)	129. Bismuth Subnitrate (see Smoke Generating Compositions)
130. Calcium Iodate (see Smoke Generating Compositions)	131. Potassium Iodate (see Smoke Generating Compositions)
132. Magnesium Chloride (see Smoke Generating Compositions)	133. Para-Nitroaniline (see Smoke Generating Compositions)
134. Iodine (see Smoke Generating Compositions)	135. Potassium Ferriccyanide (see Priming/Igniter Compositions)
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)	137. Bismuth Trioxide (see Priming/Igniter Compositions)
138. Titanium powder (see Priming/Igniter Compositions)	139. Tungsten powder (see Priming/Igniter Compositions)
140. Lead Powder (see Priming/Igniter Compositions)	141. Lead-II-Oxide (red lead; lithrage) (see Priming/Igniter Compositions)
142. Selenium powder (see Priming/Igniter Compositions)	143. Sodium Bicarbonate (see Priming/Igniter Compositions)
144. Iron powder (see Priming/Igniter Compositions)	145. Silicon Dioxide (see Priming/Igniter Compositions)
146. Lead Thiocyanate (see Priming/Igniter Compositions)	147. Para-Nitrotoluene (see Priming/Igniter Compositions)

148. Silver powder (see Priming/Igniter Compositions)	**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)	**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)	**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)	**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)	**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)	**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate	**161. Iodoform**
	
Forms colorless to white crystalline prisms, or white granules or powder. The crystals have a melting point of 414 Celsius with decomposition starting at higher temperatures. The salt is slightly soluble in cold water, but very soluble in hot water.	Iodoform forms yellow crystals or powder. The crystals have a melting point 120 Celsius with decomposition beginning thereafter. Iodoform has the odor of "operating room". The crystals are volatile with steam, but insoluble in water. The crystals are moderately soluble in the usual organic solvents.
162. Lithium Nitrate	**163. Manganese Oxide**
	
Forms colorless to white deliquescent crystals or white powder. The crystals have a melting point of 255 Celsius, with partial decomposition beginning thereafter. The solid is soluble in water and alcohol.	Forms a brownish-black powder, which is insoluble in water and the usual solvents. The powder dissolves in hydrochloric acid with the evolution of chlorine.
164. Sodium Carbonate	**165. Molybdenum powder**
	
The anhydrous form forms a white powder, or lumps, which rapidly absorb moisture from the air. The hydrates form colorless crystals, granules, or white powder. Either form reacts vigorously with acids. The crystals are soluble in water, but insoluble in alcohol and most organic solvents.	Forms a dark gray powder with metallic luster. The powder is stable in air, but may slowly oxidize upon standing. The powder readily reacts with many substances when heated.
166. Sodium Oxalate	**167. Oxalic Acid**
	
Forms white crystalline granules or powder. The crystals are only slightly soluble in water but insoluble in alcohol. The crystals are toxic so users should avoid ingestion and prolonged skin contact.	The anhydrous form forms colorless crystals or granules with a melting point of 189 Celsius. The anhydrous crystals are soluble in water. The dihydrate forms colorless crystals or white granules or powder with a melting point of 102 Celsius.

	The powder is soluble in water and alcohol.
168. Stearic acid	**169. Thorium Nitrate**
	
Stearic acid forms white crystals that melt when heated to 70 Celsius. The solid slowly volatizes when heated to 100 Celsius. The fatty solid is very slightly soluble in water, and relatively soluble in alcohol, but readily soluble in chloroform.	Forms a tetrahydrate and a hexahydrate, which form colorless crystals are white granules. The crystals are very deliquescent. Keep thorium nitrate sealed in amber glass bottles in a cool dry place. The crystals are very soluble in water and alcohol.
170. Cerium Nitrate	**171. Rubidium Nitrate**
	
Forms a hexahydrate, which forms beautiful crystals or white granules or powder. The powder is toxic so users should wear proper gloves when handling.	Forms a crystalline mass or white to slightly white or off-gray powder or granules. The solid should be stored in amber glass bottles in a cool dry place. Is capable of forming hydrates.
172. Calcium metal	**173. Mercury-II-Chloride**
	
Calcium metal forms silver-white to whitish granules. The granules are stable in air, but the powder may ignite spontaneously. The solid tarnishes in air forming a bluish-gray tinge. Calcium metal reacts vigorously with water, alcohols, and many other chemicals. The powder may detonate when heated with alkali hydroxides or carbonates.	Forms colorless crystals or a white powder or granules. The crystals have a melting point of 277 Celsius, and begin to volatize when heated to 300 Celsius. The Mercury chloride is a dangerous poison, so users should use extreme caution when handling. The crystals are only slightly soluble in water and other solvents.
174. Zirconium Carbonate	**175. Barium Chloride**
	
Forms white to grayish black to grayish white crystals or white granules or powder. The salt is insoluble in alcohol and the usual solvents—water solubility may vary dependant on grade. Reacts vigorously with acids with the evolution of carbon dioxide.	Forms a dihydrate, which forms colorless crystals or white granules or powder. The powder is toxic so users should exercise proper gloves and ventilation when handling. The crystals are very soluble in water and alcohol. The crystals are insoluble in ethanol and acetone.

- Illumination/Flare, Signaling Compositions in this section -

1. 05-05-001A: Infrared illumination composition 1: *70% cesium nitrate, 16.4% polyester binder, 10% silicon, 3.3% epoxy curing agent, 0.30% iron linoleate catalyst*	**2. 05-05-001B: Infrared illumination (modified) composition 2:** *35% cesium nitrate, 35% potassium nitrate, 16.4% polyester binder, 10% silicon, 3.3% epoxy curing agent, 0.30% iron linoleate catalyst*
3. 05-05-001C: Infrared illumination composition 3: *52.6% ammonium nitrate, 15% polyester binder, 13.3% hexamine, 8.9% cesium nitrate, 6.2% silicon, 1.7% boron, 0.89% epoxy curing agent, 0.89% iron oxide catalyst, 0.52% moisture*	**4. 05-05-002A: Flare composition 1:** *55.4% strontium nitrate, 19.8% sulfur, 19.8% potassium perchlorate, 2.9% sodium nitrate, 1.9% asphaltum, 0.1% moisture*
5. 05-05-003A: Green signaling flare composition 1: *40% barium nitrate, 40% magnesium 15% boron, 5% epoxy binder*	**6. 05-05-003B: Green signaling flare (modified) composition 2:** *50% barium nitrate, 33% magnesium 12% boron, 5% epoxy binder*
7. 05-05-003C: Green signaling flare (modified) composition 3: *55% barium nitrate, 35% magnesium 5% boron, 5% epoxy binder*	**8. 05-05-003D: Green signaling flare (modified) composition 4:** *55% barium nitrate, 35% magnesium 5% boron, 5% epoxy binder*
9. 05-05-003E: Standard US Navy signaling flare composition: *32.5% potassium perchlorate, 22.4% barium nitrate, 20.9% magnesium, 11.9% PVC, 6.9% copper, 4.9% epoxy binder, 0.5% moisture*	**10. 05-05-004A: Signaling composition 1:** *40% bismuth, 35% iodoform, 25% ammonium iodate*
11. 05-05-004B: Signaling composition 2: *45% molybdenum, 35% iodoform, 20% ammonium iodate*	**12. 05-05-005A: Signaling composition 3:** *68% bismuth subnitrate, 14% magnesium, 13% DOW epoxy binder, 5% diatomaceous earth*
13. 05-05-006A: Amber signaling flare for use in foggy conditions: *58.6% strontium nitrate, 13% potassium perchlorate, 12.4% sulfur, 12.4% sodium oxalate, 1.8% saw dust, 1.4% 0.40% impurities*	**14. 05-05-007A: Intense illuminating flare composition:** *50% aluminum, 30% potassium nitrate, 11.7% lithium nitrate, 8.1% sodium nitrate, 0.2% impurities*
15. 05-05-008A: Illuminating flare composition: *48% magnesium, 34% sodium nitrate, 18% epoxy curing agent*	**16. 05-05-009A: Illuminating composition suitable for use in ground flares:** *36.3% sodium nitrate, 36.3% aluminum, 27.2% manganese oxide, 0.20% residue*
17. 05-05-010A: Illuminating composition for long burning ground signal lights: *35% magnesium, 30% potassium dichromate, 20% strontium peroxide, 15% strontium resinate*	**18. 05-05-011A: "White light" aerial Illuminating composition for military use:** *52% magnesium, 38% barium nitrate, 7% strontium nitrate, 3% paraffin*
19. 05-05-012A: "near infrared" Illuminating composition for night vision enchantment: *70% potassium nitrate, 16% hexamine, 10% silicon, 2.8% epoxy resin, 1.2% epoxy hardener*	**20. 05-05-013A: Thermally and impact resistant "blue" signaling flare producing no ash are sparks:** *74.2% ammonium perchlorate, 11.1% copper, 11.1% stearic acid, 3.6% paraffin*
21. 05-05-013B: Thermally and impact resistant "red" signaling flare producing no ash are sparks: *72.4% ammonium perchlorate, 10.8% strontium nitrate, 10.8% stearic acid, 3.5% paraffin, 2.3% PVC, 0.20% residue*	**22. 05-05-013C: Thermally and impact resistant "yellow" signaling flare producing no ash or sparks:** *72.7% ammonium perchlorate, 10.8% stearic acid, 8.7% sodium chlorate, 3.5% paraffin, 2.1% sodium carbonate, 1.9% PVC, 0.30% residue*
23. 05-05-013D: Thermally and impact resistant "green" signaling flare producing no ash are sparks: *72.4% ammonium perchlorate, 10.8% stearic acid, 10.8% barium nitrate, 3.5% paraffin, 2.3% PVC, 0.20% residue*	**24. 05-05-014A: Sea marker pyrotechnic composition:** *50.5% anhydrous calcium sulfate, 44.1% amorphous phosphorus, 3% urea, 2.3% linseed oil, 0.10% residue*
25. 05-05-015A: Smokeless flare with brilliant incandescent properties: *98.2% thorium nitrate, 0.99% cerium nitrate, 0.38% aluminum, 0.38% barium nitrate, 0.05% impurities*	**26. 05-05-016A: "near infrared" Illuminating composition for night vision enhancement:** *60.8% rubidium nitrate, 23.2% hexamine, 10% silicon, 4.2% epoxy resin, 1.8% epoxy hardener*
27. 05-05-017A: Illuminating composition for illuminating the battlefield, and other uses: *46.6% magnesium, 33% sodium nitrate, 17.4% GDGE epoxy resin, 2.9% maleic anhydride curing agent, 0.10% impurities*	**28. 05-05-017B: Illuminating composition for illuminating the battlefield, and other uses (with reduced glare):** *47.2% magnesium, 32.5% potassium chlorate, 17.9% GDGE epoxy resin, 2.2% APO curing agent, 0.20% residue*
29. 05-05-018A: Military illuminating composition for various operations: *62% magnesium, 35% sodium nitrate, 1.8% polyglycol resin QX-3812, 1.1% epoxy resin D.E.R. 732, 0.10% residue*	**30. 05-05-019A: High altitude illuminating composition for signaling, spotting, identifying and other operations:** *30% potassium perchlorate, 30% aluminum powder, 30% barium nitrate, 10% calcium metal*
31. 05-05-019B: High altitude illuminating composition for signaling, spotting, identifying and other operations (modified): *80% calcium metal, 10% potassium perchlorate, 10% sodium nitrate*	**32. 05-05-020A: Flickering signal flare producing radar waves and infrared radiation for use in confusing radar guided missiles/munitions, and for confusing anti-surface-to-air-missile systems used on aircraft:** *39.1% Viton A copolymer, 24% magnesium, 20% hexachlorobenzene, 15% ammonium perchlorate, 1% cesium nitrate, 0.5% benzoyl peroxide, 0.2% triethyleneglycol, 0.1% glycidyl methacrylate, 0.1% propyleneglycol monoacrylate*
33. 05-05-020B: Flickering signal flare producing radar waves and infrared radiation for use in confusing radar guided missiles/munitions, and for confusing anti-surface-to-air-missile systems used on aircraft (with increased radar emitions): *39.1% Viton A copolymer, 24% magnesium, 20% hexachlorobenzene, 15% sodium perchlorate, 1% cesium nitrate, 0.5% benzoyl peroxide, 0.2% triethyleneglycol, 0.1% glycidyl methacrylate, 0.1% propyleneglycol monoacrylate*	**34. 05-05-021A: Smooth burning luminous flare composition:** *58.5% magnesium, 31.5% sodium nitrate, 9% copolymer binder, 0.9% cumene hydroperoxide, 0.1% residue*
35. 05-05-022A: Increased luminosity signal composition for use in spotting: *49.5% strontium nitrate, 16.8% magnesium, 13.8% calcium resinate, 5.9% aluminum, 4.9% zinc oxalate, 4.9% zinc chloride, 3.9% sodium nitrate, 0.30% impurities*	**36. 05-05-023A: Signal composition for use in flares for road work and for traffic control:** *55% iron-III-oxide, 30% magnesium, 10% barium nitrate, 5% sulfur*
37. 05-05-023B: Signal composition for use in flares for road work and for traffic control 2: *35% magnesium, 30% potassium dichromate, 20% strontium peroxide, 15% strontium resinate*	**38. 05-05-024A: US Army "rita" flare composition:** *66.7% magnesium, 28.5% sodium nitrate, 4.8% epoxy binder*
39. 05-05-025A: MK 21 flare composition: *54% magnesium, 34% sodium nitrate, 12% binder*	**40. 05-05-026A: Yellow Naval flare composition for sea use:** *30% barium nitrate, 27% sodium oxalate, 19% potassium perchlorate, 18% magnesium, 4% asphaltum, 1% binder*
41. 05-05-027A: Red torch composition for multiple uses: *58.44% strontium nitrate, 9.09% potassium perchlorate, 9.09% paraffin, 7.79% sulfur, 5.19% nitrocellulose, 2.59% petrolatum, 2.59% potassium nitrate, 2.59% strontium carbonate, 2.59% sawdust, 2.59% paraffin, 0.04% impurities*	**42. 05-05-028A: Illumination composition for grenades:** *63.63% magnesium powder, 36.36% Kel-F copolymer binder, 0.01% mixed balance*
43. 05-05-029A: Illumination composition for various munitions: *41.46% sodium perchlorate, 41.46% granulated magnesium, 7.65% glycidyl methacrylate, 7.65% liquid basic polyester resin, 1.18% benzoyl peroxide cure catalyst, 0.493% ethylene dimethacrylate, 0.098% N,N-dimethyl-p-toluidine curing agent, 0.009% mixed balance*	**44. 05-05-030A: Illumination/photoflash composition for high altitude operations:** *30% potassium perchlorate, 30% barium nitrate, 30% calcium metal powder, 10% aluminum powder*
45. 05-05-030B: Illumination/photoflash composition for high altitude operations: *30.25% sodium nitrate, 25.64% barium nitrate, 21% magnesium powder, 15.38% calcium metal, 7.69% aluminum powder, 0.04% mixed impurities*	**46. 05-05-031A: Illumination/photoflash composition for ground and high altitude operations:** *60% calcium metal powder, 40% sodium perchlorate*
47. 05-05-032A: Self-hardening illumination composition for various operations: *58.55% magnesium powder, 31.53% sodium nitrate, 9% Mercaptan binder, 0.90% cumene hydroperoxide, 0.02% mixed impurities*	**48. 05-05-032B: Self-hardening illumination composition for various operations:** *59.06% magnesium powder, 31.8% barium nitrate, 9.08% polyester binder, 0.045% benzoyl peroxide, 0.015% mixed impurities*
49. 05-05-032C: Self-hardening illumination composition for various operations with reddish tint: *58.82% magnesium powder, 31.67% strontium nitrate, 9% dichlorostyrene binder, 0.226% benzoyl peroxide, 0.226% stannic chloride catalyst, 0.058% mixed impurities*	**50. 05-05-033A: Illumination composition for various operations:** *50% magnesium powder, 42.7% sodium nitrate, 4.5% polyvinyl acetate, 2.8% magnesium oxide*
51. 05-05-033B: Reduced illumination composition for use in enclosed areas: *50% magnesium powder, 42.7% sodium nitrate, 7.3% polyvinyl acetate*	**52. 05-05-034A: Brilliant red signal/flare compound (single component composition):** *99% hexamine/strontium nitrate complex, 1% mixed balance*
53. 05-05-034B: Brilliant voluminous red signal/flare compound: *82.94% hexamine/nitrate complex salt, 11% magnesium powder, 5.5% graphite, 0.55% mercury-II-chloride, 0.01% residual balance*	**54. 05-05-035A: Signaling composition with dense smoke effect:** *50.5% red phosphorus, 35.35% manganese dioxide, 5.05% magnesium powder, 5.05% aluminum powder, 3.03% zinc oxide, 1.01% linseed oil coating, 0.01% mixed balance*
55. 05-05-036A: Signaling composition with shower spark effect: *42.1% ammonium perchlorate, 31.57% zirconium metal powder, 15.78% coarse zirconium metal, 10.52% zirconium*	**56. 05-05-037A: Smokeless and ash less signal flare composition:** *74.2% ammonium perchlorate, 11.1% stearic acid, 11.1% copper dust, 3.6% paraffin*

carbonate, 0.03% residual balance	
57. 05-05-038A: "Red light" signal flare composition: *42.37% strontium nitrate, 42.37% potassium chlorate, 12.71% linseed glue, 2.54% softwood charcoal, 0.01% mixed residual balance*	**58. 05-05-038B: "White light" signal flare composition:** *58.82% potassium chlorate, 23.52% barium nitrate, 11.76% linseed glue, 5.88% white chalk, 0.02% mixed residual balance*
59. 05-05-038C: "Blue light" signal flare composition: *74.07% potassium chlorate, 14.81% copper oxychloride, 11.11% linseed glue, 0.01% mixed residual balance*	**60. 05-05-038D: "Green light" signal flare composition:** *57.47% barium chloride, 28.73% barium nitrate, 13.79% linseed glue, 0.01% mixed balance*
61. 05-05-038E: "Yellow light" signal flare composition: *72.46% potassium chlorate, 14.49% sodium oxalate, 10.86% linseed glue, 2.17% soft wood charcoal, 0.02% residual balance*	**62. 05-05-038F: "Rose colored light" signal flare composition:** *71.42% potassium chlorate, 17.85% white chalk, 10.71% linseed glue, 0.02% mixed residual balance*
63. 05-05-039A: Naval green signal flare composition for marine use: *35.25% barium nitrate, 25.83% potassium perchlorate, 17.91% magnesium powder, 16.58% PVC powder, 4.4% binder mixture, 0.03% mixed balance*	**64. 05-05-039B: Naval yellow signal flare composition for marine use:** *28.99% barium nitrate, 26.43% sodium oxalate, 18.76% potassium perchlorate, 17.91% magnesium powder, 4.26% asphaltum, 3.62% binder mixture, 0.03% mixed residual balance*

05-05-001A: Infrared illumination composition 1:
Place into a standard ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, ***164 grams of WITCO 17-80 liquid polyester binder (triethyleneglycol succinate)***, manufactured by Witco Corp, followed by ***33 grams of any epoxy curing*** resin (such as epoxy ERL 0510 of Ciba-Geigy Corporation), and then followed by ***3 grams of iron linoleate***, and then tumble the mixture at 200 RMP at room temperature for about 30 minutes. Thereafter, or at the same time, place into a separate ball mill, ***700 grams of cesium nitrate***, followed by ***100 grams of finely divided elemental silicon***, and then tumble the mixture at 190 RPM at room temperature for about 15 to 30 minutes. Thereafter, while continuing to tumble the cesium nitrate/silicon mixture, add in the WITCO binder mixture previously prepared and then tumble the combined mixtures for 10 to 15 minutes at 190 RPM at room temperature. Afterwards, the composition is ready for use. To use, the composition should be poured into any desirable container, flare, mold, tube, ect., ect., and then allowed to cure for several days until a dry solid material is obtained. Note: actual curing times may vary.
Burn rate: 0.06 inches per second.
Average IR: 741.2 mV
Average visible IR: 45 mV
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% cesium nitrate, 16.4% polyester binder, 10% silicon, 3.3% epoxy curing agent, 0.30% iron linoleate catalyst***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Composition used extensively in flares for illumination purposes and for anti-infrared munition purposes (to confuse or distract infrared guided weapons).

05-05-001B: Infrared illumination (modified) composition 2:
Place into a standard ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, ***164 grams of WITCO 17-80 liquid polyester binder (triethyleneglycol succinate)***, manufactured by Witco Corp, followed by ***33 grams of any epoxy curing*** resin (such as epoxy ERL 0510 of Ciba-Geigy Corporation), and then followed by ***3 grams of iron linoleate***, and then tumble the mixture at 200 RMP at room temperature for about 10 to 15 minutes. Thereafter, or at the same time, place into a separate ball mill, ***350 grams of cesium nitrate***, followed by ***350 grams of potassium nitrate***, and then followed by ***100 grams of finely divided elemental silicon***, and then tumble the mixture at 190 RPM at room temperature for about 10 to 15 minutes. Thereafter, while continuing to tumble the cesium nitrate/potassium nitrate/silicon mixture, add in the WITCO binder mixture previously prepared and then tumble the combined mixture for 10 to 15 minutes at 190 RPM at room temperature. Afterwards, the composition is ready for use. To use, the composition should be poured into any desirable container, flare, mold, tube, ect., ect., and then allowed to cure for several days until a dry solid material is obtained. Note: actual curing times may vary.
Burn rate: 0.07 inches per second.
Average IR: 1.9 v
Average visible IR: 156 mV
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.

Explosive ability: None.
Percentage: ***35% cesium nitrate, 35% potassium nitrate, 16.4% polyester binder, 10% silicon, 3.3% epoxy curing agent, 0.30% iron linoleate catalyst***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Composition used extensively in flares for illumination purposes and for anti-infrared munition purposes (to confuse or distract infrared guided weapons).

05-05-001C: Infrared illumination composition 3:
Place into a standard "vertical" ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, ***170 grams of WITCO 17-80 liquid polyester binder (triethyleneglycol succinate)***, manufactured by Witco Corp, followed by ***10 grams of any epoxy curing*** resin (such as epoxy ERL 0510 of Ciba-Geigy Corporation), and then followed by ***10 grams of ferric oxide***, and then rotate the mixture at 200 RMP at room temperature for about 15 to 30 minutes. Thereafter, or at the same time, place into a separate ball mill, ***590 grams of ammonium nitrate***, followed by ***100 grams of cesium nitrate***, followed by ***70 grams of finely divided elemental silicon***, followed by ***150 grams of hexamine (methamine)***, and then followed by ***20 grams of finely divided elemental boron***, and then rotate the mixture at 190 RPM at room temperature for about 15 to 30 minutes. Thereafter, while continuing to rotate the ammonium nitrate/cesium nitrate/silicon and boron mixture, add in the WITCO binder mixture previously prepared and then rotate the combined mixture for about 10 to 15 minutes at 190 RPM at room temperature. Afterwards, the composition is ready for use. To use, the composition should be poured into any desirable container, flare, mold, tube, ect., ect., and then allowed to cure for several days until a dry solid material is obtained. Note: actual curing times may vary.
Burn rate: Average.
Average IR: Not calculated—less then composition 2.
Average visible IR: Not calculated—less then composition 2.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.6% ammonium nitrate, 15% polyester binder, 13.3% hexamine, 8.9% cesium nitrate, 6.2% silicon, 1.7% boron, 0.89% epoxy curing agent, 0.89% iron oxide catalyst, 0.52% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Composition used extensively in flares for illumination purposes and for anti-infrared munition purposes (to confuse or distract infrared guided weapons).

05-05-002A: Flare composition 1:
Place into a standard heated ball mill containing 100 grams of Teflon coated steel shot of 5 millimeters in diameter, ***80 grams of flours of sulfur***, followed by ***8 grams of asphaltum***, and then tumble the mixture at 250 RPM at 40 Celsius for 1 hour. Thereafter, add in ***12 grams of sodium nitrate***, followed by ***80 grams of potassium perchlorate***, and then followed by ***224 grams of strontium nitrate***, and then tumble the mixture at 200 RPM, but reduce heat to room temperature and mix for about 1 hour. After mixing for 1 hour, the composition is ready for use. To use, the composition should be pressed under pressure (500+ psi) into any desirable container, flare, mold, tube, ect., ect., and then allowed to cure for several days until a dry solid material is obtained. Note: actual curing times may vary.
Burn rate: Smooth.
Candle power: 700 candelas at 0.8 inch diameter disc of composition
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55.4% strontium nitrate, 19.8% sulfur, 19.8% potassium perchlorate, 2.9% sodium nitrate, 1.9% asphaltum, 0.1% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Composition used extensively in flares for illumination purposes.

05-05-003A: Green signaling flare composition 1:
Into a suitable mixing bowl, beaker, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***25 grams of DOW epoxy binder*** (80% of Dow epoxy resin, CX7069.7, and 20% of a DOW polyamine, CX3482.1), followed by ***75 grams of finely divided elemental boron,*** followed by ***200 grams of magnesium powder,*** followed by ***200 grams of barium nitrate***, and then blend the mixture on moderate speed for about 10 to 15 minutes. Thereafter, the mixture is ready to go. To use, it needs to be pressed

into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of about 8000 psi. The tubes should then be cured for several days.
Burn rate: 20 Seconds with 150-gram pressed sample.
Candle power: 47,800
Light wavelength: 553 nm
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% barium nitrate, 40% magnesium 15% boron, 5% epoxy binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-003B: Green signaling flare (modified) composition 2:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***25 grams of DOW epoxy binder*** (80% of Dow epoxy resin, CX7069.7, and 20% of a DOW polyamine, CX3482.1), followed by ***60 grams of finely divided elemental boron,*** followed by ***165 grams of magnesium powder,*** followed by ***250 grams of barium nitrate***, and then tumble the mixture at 300 RPM for 10 to 15 minutes. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of about 8000 psi. The tubes should then be cured for several days.
Burn rate: 19 Seconds with 150-gram sample.
Candle power: 59,900
Light wavelength: 554 nm
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% barium nitrate, 33% magnesium 12% boron, 5% epoxy binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-003C: Green signaling flare (modified) composition 3:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***25 grams of DOW epoxy binder*** (80% of Dow epoxy resin, CX7069.7, and 20% of a DOW polyamine, CX3482.1), followed by ***25 grams of finely divided elemental boron,*** followed by ***175 grams of magnesium powder,*** followed by ***275 grams of barium nitrate***, and then tumble the mixture at 300 RPM for 10 to 15 minutes. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of about 8000 psi. The tubes should then be cured for several days.
Burn rate: 23 Seconds with 150-gram sample.
Candle power: 63,400
Light wavelength: 552 nm
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55% barium nitrate, 35% magnesium 5% boron, 5% epoxy binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-003D: Green signaling flare (modified) composition 4:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***25 grams of DOW epoxy binder*** (80% of Dow epoxy resin, CX7069.7, and 20% of a DOW polyamine, CX3482.1), followed by ***30 grams of finely divided elemental boron,*** followed by ***195 grams of magnesium powder,*** followed by ***250 grams of barium nitrate***, and then tumble the mixture at 300 RPM for 10 to 15 minutes. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds

(preferably of the fish-paper type) of any desirable size and material under a pressure of about 8000 psi. The tubes should then be cured for several days.
Burn rate: 23 Seconds with 150-gram sample.
Candle power: 71,700
Light wavelength: 554 nm
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55% barium nitrate, 35% magnesium 5% boron, 5% epoxy binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-003E: Standard US Navy signaling flare composition:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***25 grams of US standard epoxy binder***, followed by ***35 grams of finely divided copper,*** followed by ***105 grams of magnesium powder,*** followed by ***112.5 grams of barium nitrate***, and then tumble the mixture at 300 RPM for 10 to 15 minutes. Thereafter, throw in ***60 grams of finely divided PVC,*** followed by ***162.6 grams of potassium perchlorate,*** and then followed by 150 milliliters of tetrahydrofuran, and then continue to tumble the mixture for about 15 minutes at 300 RPM. Thereafter, place the mixture into a clean beaker, mixing bowl or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, and then blend the mixture on moderate speed until practically all the solvent has evaporated. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of about 8000 psi, and then allowed to cure. The tubes should then be cured for several days. As with all the compositions listed in this book, numerous modifications exist.
Burn rate: 42 Seconds with 150-gram sample.
Candle power: 12,200
Light wavelength: 562 nm
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***32.5% potassium perchlorate, 22.4% barium nitrate, 20.9% magnesium, 11.9% PVC, 6.9% copper, 4.9% epoxy binder, 0.5% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-004A: Signaling composition 1:
Into a suitable blender equipped with plastic stir blade, place ***200 grams of finely divided bismuth,*** followed by ***175 grams of iodoform,*** and then followed by ***125 grams of ammonium iodate***, and then gently blend the mixture on low at room temperature for about 2 hours to form a uniform mixture. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of 7500 psi. The tubes should then be cured for several days.
Burn rate: 0.2 centimeters per second.
Smoke volume: High
Marker color (smoke color): Reddish-brown.
Signal color (flame color): bright yellowish-white.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% bismuth, 35% iodoform, 25% ammonium iodate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-004B: Signaling composition 2:

Into a suitable blender equipped with plastic stir blade, place ***100 grams of finely divided molybdenum,*** followed by ***225 grams of iodoform,*** and then followed by ***175 grams of ammonium iodate***, and then gently blend the mixture on low at room temperature for about 2 hours to form a uniform mixture. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of 7500 psi. The tubes should then be cured for several days.

Burn rate: 0.2 centimeters per second.
Smoke volume: High
Marker color (smoke color): Reddish-purple.
Signal color (flame color): bright yellowish-orange.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% molybdenum, 35% iodoform, 20% ammonium iodate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-005A: Signaling composition 3:

Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***65 grams of DOW epoxy binder*** (70% DER 321 and 30% DEH), followed by ***25 grams of diatomaceous earth,*** followed by ***70 grams of magnesium powder,*** followed by ***340 grams of bismuth subnitrate***, and then tumble the mixture at 300 RPM for 15 to 30 minutes. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of about 8300 psi. The tubes should then be cured for several days.

Burn rate: 0.1 centimeters per second.
Smoke volume: High.
Marker color (smoke color): yellowish-white.
Signal color (flame color): brilliant yellow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***68% bismuth subnitrate, 14% magnesium, 13% DOW epoxy binder, 5% diatomaceous earth***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signal flares, markers, warning devices, and general purpose signal munitions.

05-05-006A: Amber signaling flare for use in foggy conditions:

Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***7.5 grams of saw dust***, followed by ***50 grams of sodium oxalate***, and followed by ***50 grams of flours of sulfur***. Thereafter, tumble the mixture at 200 RPM for 1 hour. After 1 hour, throw in ***6 grams of lead dioxide***, followed by ***52.5 grams of potassium perchlorate***, and then followed by ***235 grams of strontium nitrate***. Then continue to tumble the mixture at 200 RPM for about 2 hours at room temperature. After 2 hours, the mixture is ready to be pressed. To do so, simply press it into any desirable container, tube, mold, ect., under a pressure of about 7500 psi, and then allow the container, tube, or mold to cure for several days at room temperature.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.6% strontium nitrate, 13% potassium perchlorate, 12.4% sulfur, 12.4% sodium oxalate, 1.8% saw dust, 1.4% 0.40% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in commercial flares for rail road operations, shipping docks, and ship barges.

05-05-007A: Intense illuminating flare composition:

Into a suitable beaker or similar container, place ***150 grams of potassium nitrate***, followed by ***58.7 grams of lithium nitrate***, and then followed by ***40.7 grams of sodium nitrate***. Then gently heat the mixture using a hot plate to about 120 Celsius. When the temperature of the mixture reaches about 120 Celsius, the mixture should begin to melt and fuse. When the mixture begins to melt, gently stir it to form a uniform mixture for about 15 minutes at 120 Celsius. After which, remove the heat source and allow the fused molten mixture to cool to room temperature. When it does, place it into a ball mill, followed by ***250 grams of aluminum powder***, and then add in 100 grams of Teflon coated steel shot of 5 millimeters in diameter, and then gently tumble the mixture at 100 RPM for about 2 hours to form a uniform dry mixture. After 2 hours, the powder is ready for use. To use, place the powdered mixture into a clean beaker or suitable container, and then gently heat the mixture to 145 Celsius. When the mixture reaches 145 Celsius, it should melt forming a molten mass. Once the mixture has melted, gently stir it for 5 minutes using a metal spoon, and then gently vibrate the mixture for 5 minutes to remove air bubbles and allow for compaction of the mix, and then pour the molten mixture directly into any desirable flare casing, tube, container or mold of your choice, and then gently vibrate the casing to remove potential air bubbles, and then allow the casing to cure for 24 hours.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% aluminum, 30% potassium nitrate, 11.7% lithium nitrate, 8.1% sodium nitrate, 0.2% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military and commercial sky illuminating munitions.

05-05-008A: Illuminating flare composition:

Into a suitable beaker or similar container, equipped with motorized stirrer utilizing a standard plastic mixing blade, place ***240 grams of standard magnesium powder***, followed by ***170 grams of 200 mesh sodium nitrate***, followed by ***90 grams of epoxy curing agent*** (glycerin diglycidyl ether), and then rapidly blend the mixture for about 15 to 30 minutes at room temperature. Afterwards, the mixture is ready to go. To use, it should be poured into any desirable flare container, tube, casing, or mold (preferably of the fish-paper type) and then cure the munition in an oven at 60 Celsius for about 4 to 5 hours.

Burn rate: Average
Light intensity: 40,000
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48% magnesium, 34% sodium nitrate, 18% epoxy curing agent***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military and commercial sky illuminating munitions.

05-05-009A: Illuminating composition suitable for use in ground flares:

Into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place 200 milliliters of hexane, followed by ***200 grams of sodium nitrate***, followed by ***200 grams of standard aluminum powder***, and then moderately blend the mixture for 1 hour at room temperature. After 1 hour, add in ***150 grams of manganese oxide (Mn3O4)***, followed by 100 milliliters of additional hexane, and then continue to blend the mixture on moderate speed for about 1 hour at room temperature. After 1 hour, filter-off the insoluble mass, to separate it from the hexane. Gravity filtration can be used but vacuum filtration is preferred. If using vacuum filtration, do not dry the filtered-off mass to complete dryness, and leave it slightly damp. After the filtration process, the damp mass is ready for use. To use, it needs to be pressed and vibrated into any desirable container (fish tube), tube, or mold under pressure of about 100 to 200 psi.

Burn rate: 0.20 inches per second.
Light intensity: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***36.3% sodium nitrate, 36.3% aluminum, 27.2% manganese oxide, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used in military and commercial ground illuminating devices.

05-05-010A: Illuminating composition for long burning ground signal lights:
Into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place 150 milliliters of 95% ethyl alcohol, followed by ***175 grams of standard powdered magnesium***, followed by ***75 grams of strontium resinate***, and then moderately blend the mixture for 1 hour at room temperature. After 1 hour, add in ***100 grams of strontium peroxide***, followed by 50 milliliters of acetone, and then add in ***150 grams of potassium*** dichromate, and then continue to blend the mixture on moderate speed until the bulk of the solvents have evaporated to the point where only a dough-like material remains. Thereafter, the dough like material should be packed and pressed into any desirably container, tube, mold, ect., under mild pressure and the resulting container, tube, ect., should then be vibrated for a short while and then allowed to cure for several days. Requires igniter composition for proper ignition.
Burn rate: Slow.
Light intensity: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35% magnesium, 30% potassium dichromate, 20% strontium peroxide, 15% strontium resinate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military and commercial ground illuminating devices for traffic directing, directing air flights, singling trains, ect.,

05-05-011A: "White light" aerial Illuminating composition for military use:
Into a suitable ball mill filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***15 grams of paraffin***, followed by ***260 grams of standard powdered magnesium***, and then tumble the mixture at 100 RPM for 30 minutes. Thereafter, throw in ***35 grams of strontium nitrate***, followed by ***190 grams of barium nitrate***, and then followed by 50 milliliters of 95% alcohol, and then continue to tumble the mixture for about 1 hour at 100 RPM. Afterwards, pour the mixture onto a shallow pan, and allow it to thoroughly air-dry until the odor of solvent is gone. Thereafter, place the mixture into a clean ball mill, and tumble the mixture with 100 grams of Teflon coated steel shot of 5 millimeters in diameter at 150 RPM for 2 hours to form a uniform mixture. Thereafter, the mixture is ready to go. To use, it needs to be pressed into tubes or molds (preferably of the fish-paper type) of any desirable size and material under a pressure of about 10000 psi. As with all the compositions listed in this book, numerous modifications exist.
Burn rate: Slow.
Light intensity: 174,000 candle power.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52% magnesium, 38% barium nitrate, 7% strontium nitrate, 3% paraffin***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in military battlefield illumination flares.

05-05-012A: "near infrared" Illuminating composition for night vision enhancement:
Into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place ***14 grams of epoxy resin D.E.R. 321***, followed by ***80 grams of hexamine***, followed by ***50 grams of standard powdered silicon***, and then moderately blend the mixture for 5 to 10 minutes at room temperature. Afterwards, add in ***350 grams of potassium nitrate***, followed by ***6 grams of epoxy hardener D.E.H. 14***, and then continue to blend the mixture for about 5 to 10 minutes at room temperature. Thereafter, the mixture is ready to be used. To use, it needs to be poured and pressed into any desirable container, tube, candle, ect., under a pressure of about 4000 psi, and then allow the munition to cure at room temperature for 2 days. Requires igniter composition for proper ignition.
Burn rate: Average.
Infrared radiation: 0.76 microns
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% potassium nitrate, 16% hexamine, 10% silicon, 2.8% epoxy resin, 1.2% epoxy hardener***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used to enhance night vision devices on the battlefield.

05-05-013A: Thermally and impact resistant "blue" signaling flare producing no ash or sparks:
Into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place ***18 grams of paraffin***, followed by ***55.5 grams of standard coppers dust***, followed by ***55.5 grams of stearic acid***, and then moderately blend the mixture for 1 hour at room temperature. After 1 hour, add in ***371 grams of ammonium perchlorate***, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready to be used. To use, it needs to be pressed into any desirable container, tube, candle, ect., under a pressure of about 8000 psi. Requires igniter composition for proper ignition.
Burn rate: 20 inches per second at ¾ inch diameter flare "candle"
Ignition temperature: 250 Celsius.
Daylight visibility: 1500 yards.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***74.2% ammonium perchlorate, 11.1% copper, 11.1% stearic acid, 3.6% paraffin***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signaling on the battlefield for military operations.

05-05-013B: Thermally and impact resistant "red" signaling flare producing no ash or sparks:
As in the previous preparation, place into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place ***18 grams of paraffin***, followed by ***55.5 grams of strontium nitrate***, followed by ***55.5 grams of stearic acid***, followed by ***12 grams of finely divided PVC***, and then moderately blend the mixture for 1 hour at room temperature. After 1 hour, add in ***371 grams of ammonium perchlorate***, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready to be used. To use, it needs to be pressed into any desirable container, tube, candle, ect., under a pressure of about 8000 psi. Requires igniter composition for proper ignition.
Burn rate: 15 to 20 inches per second at ¾ inch diameter flare "candle".
Daylight visibility: 1500 yards.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.4% ammonium perchlorate, 10.8% strontium nitrate, 10.8% stearic acid, 3.5% paraffin, 2.3% PVC, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signaling on the battlefield for military operations.

05-05-013C: Thermally and impact resistant "yellow" signaling flare producing no ash or sparks:
As in the previous preparation, place into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place ***18 grams of paraffin***, followed by ***44.4 grams of sodium chlorate***, followed by ***11.1 grams of sodium carbonate***, followed by ***55.5 grams of stearic acid***, followed by ***10 grams of finely divided PVC***, and then moderately blend the mixture for 1 hour at room temperature. After 1 hour, add in ***371 grams of ammonium perchlorate***, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready to be used. To use, it needs to be pressed into any desirable container, tube, candle, ect., under a pressure of about 8000 psi. Requires igniter composition for proper ignition.
Burn rate: 15 to 20 inches per second at ¾ inch diameter flare "candle".
Daylight visibility: Similar to 05-05-013A
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.7% ammonium perchlorate, 10.8% stearic acid, 8.7% sodium chlorate, 3.5% paraffin, 2.1% sodium carbonate, 1.9% PVC, 0.30% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signaling on the battlefield for military operations.

05-05-013D: Thermally and impact resistant "green" signaling flare producing no ash or sparks:
As in the previous preparation, place into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place ***18 grams of paraffin***, followed by ***55.5 grams of barium nitrate***, followed by ***55.5 grams of stearic acid***, followed by ***12 grams of finely divided PVC,*** and then moderately blend the mixture for 1 hour at room temperature. After 1 hour, add in ***371 grams of ammonium perchlorate***, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready to be used. To use, it needs to be pressed into any desirable container, tube, candle, ect., under a pressure of about 8000 psi. Requires igniter composition for proper ignition.
Burn rate: 15 to 20 inches per second at ¾ inch diameter flare "candle".
Daylight visibility: Similar to 05-05-013A
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.4% ammonium perchlorate, 10.8% stearic acid, 10.8% barium nitrate, 3.5% paraffin, 2.3% PVC, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signaling on the battlefield for military operations.

05-05-014A: Sea marker pyrotechnic composition:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***218.5 grams of finely ground amorphous red phosphorus***, followed by ***250 grams of anhydrous calcium sulfate***, followed by ***15 grams of urea***, and then followed by ***11.5 grams of boiled linseed oil***, and then tumble the mixture at 300 RPM or so for about 1 hour to form a uniform mix. After tumbling for 1 hour, the mixture is ready for use. To use, it simply needs to be pressed into any desirable container, tube, mold, ect., under a pressure of about 5000 psi. Requires proper ignition composition for proper burn.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50.5% anhydrous calcium sulfate, 44.1% amorphous phosphorus, 3% urea, 2.3% linseed oil, 0.10% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used by military or commercial ships for spotting, marking, and signaling for multiple purposes. Can also be used in flares.

05-05-015A: Smokeless flare with brilliant incandescent properties:
Into a suitable mixing bowl, blender, ect., place 150 milliliters of hexane, followed by ***496 grams of thorium nitrate***, followed by ***5 grams of cerium nitrate***, and then followed by ***1.95 grams of powdered aluminum*** of average mesh, and ***1.95 grams of barium nitrate***. Thereafter, blend the mixture until the bulk of the hexane evaporates. Thereafter, place the semi-pasty mass onto a shallow pan, and allow it to thoroughly air-dry. After it has, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of 5 millimeters in diameter at 150 grams total weight, and then tumble the mixture at 100 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into any desirable flare body, tube, fish paper tube, mold, ect., under a pressure of about 3000 psi. Requires suitable ignition composition for proper burn.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***98.2% thorium nitrate, 0.99% cerium nitrate, 0.38% aluminum, 0.38% barium nitrate, 0.05% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in special flares for signaling and spotting during poor weather night operations.

05-05-016A: "near infrared" Illuminating composition for night vision enhancement:
Into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, place ***21 grams of epoxy resin D.E.R. 321***, followed by ***116 grams of hexamine***, followed by ***50 grams of standard powdered silicon***, and then moderately blend the mixture for 5 to 10 minutes at room temperature. Afterwards, add in ***304 grams of rubidium nitrate***, followed by ***9 grams of epoxy hardener D.E.H. 14***, and then continue to blend the mixture for about 5 to 10 minutes at room temperature. Thereafter, the mixture is ready to be used. To use, it needs to be poured and pressed into any desirable container, tube, candle, ect., under a pressure of about 4000 psi, and then allow the munition to cure at room temperature for 2 days. Requires igniter composition for proper ignition.

Burn rate: Average. 1-½ minutes at 1 ¼ inch diameter by 1 ¼ inch length.
Infrared radiation: 0.80 microns at 1 ¼ inch diameter by 1 ¼ inch length.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60.8% rubidium nitrate, 23.2% hexamine, 10% silicon, 4.2% epoxy resin, 1.8% epoxy hardener***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to enhance night vision devices on the battlefield without significantly illuminating the battlefield.

05-05-017A: Illuminating composition for illuminating the battlefield, and other uses:
Into a standard ball mill, containing 150 grams of more of Teflon coated steel shot of 5 to 10 millimeters in diameter, place ***240 grams of standard magnesium powder***, followed by ***170 grams of sodium nitrate*** of 300 mesh, and then tumble the mixture at 100 RPM for about 15 to 30 minutes. Thereafter, place into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, ***90 grams of GDGE epoxy resin*** (a glycerin diglycidyl ether), and then moderately blend the mixture for 5 minutes to form a homogenous substance. Immediately thereafter, add in the tumbled dry mixture of sodium nitrate/magnesium, and then continue to blend the mixture at moderate speed for about 10 to 15 minutes. After 10 to 15 minutes, add in ***15 grams of maleic anhydride***, and then continue to blend the mixture for 5 to 10 minutes at moderate speed. Thereafter, the liquid mixture is ready to be cast. To use, the liquid mixture needs to be poured into any desirable container, tube, candle, ect., and then cure the munition in an oven at 70 Celsius for about 4 hours. Requires igniter composition for proper ignition.
Burn rate: Average.
Average candle efficiency: 33,000 per second per gram.
Average intensity: 70,000 to 80,000 candle light.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.6% magnesium, 33% sodium nitrate, 17.4% GDGE epoxy resin, 2.9% maleic anhydride curing agent, 0.10% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military and commercial operations for illuminating terrain at night, and/or poor weather conditions for use in signaling.

05-05-017B: Illuminating composition for illuminating the battlefield, and other uses (with reduced glare):
As in the above procedure, into a standard ball mill, containing 150 grams of more of Teflon coated steel shot of 5 to 10 millimeters in diameter, place ***240 grams of standard magnesium powder***, followed by ***165 grams of potassium chlorate***, and then tumble the mixture at 100 RPM for about 15 to 30 minutes. Thereafter, place into a suitable mixing bowl or blender, equipped with motorized stirrer and plastic stir blade, ***91 grams of GDGE epoxy resin*** (a glycerin diglycidyl ether), and then moderately blend the mixture for 5 minutes to form a homogenous substance. Immediately thereafter, add in the tumbled dry mixture of sodium nitrate/magnesium, and then continue to blend the mixture at moderate speed for about 10 to 15 minutes. After 10 to 15 minutes, add in ***11.5 grams of amine terminated polypropylene oxide (APO,*** commercially available), and then continue to blend the mixture for 5 to 10 minutes at moderate speed. Thereafter, the liquid mixture is ready to be cast. To use, the liquid mixture needs to be poured into any desirable container, tube, candle, ect., and then cure the munition in an oven at 70 Celsius for about 4 hours. Requires igniter composition for proper ignition.
Burn rate: Average
Average candle efficiency: 40,000 per second per gram.
Average intensity: 50,000 to 60,000 candle light.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.

Percentage: *47.2% magnesium, 32.5% potassium chlorate, 17.9% GDGE epoxy resin, 2.2% APO curing agent, 0.20% residue*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military and commercial operations for illuminating terrain at night, but is not suitable for use in poor weather conditions for use in signaling.

05-05-018A: Military illuminating composition for various operations:

Into a standard mixing bowl, blender, or similar device utilizing a motorized stirrer and plastic stir blades, place ***5.5 grams of epoxy resin D.E.R. 732***, followed by ***9 grams of polyglycol resin QX-3812***, followed by ***175 grams of sodium nitrate***, and then followed by ***310 grams of finely granulated magnesium*** of size 18 standard. Thereafter blend the mixture for about 10 to 15 minutes at moderate speed and at room temperature to form a homogenous mixture. After the 10 to 15 minute mixing period, the composition is ready to be cast. To do so, it simply needs to be poured and vibrated into any desirable body, flare body, container, tube, ect., and the cured in an oven at 70 Celsius for 24 hours. Requires a standard ignition composition.
Burn rate: 39 grams per second.
Average intensity: 1.6 x 10^6
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¼
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *62% magnesium, 35% sodium nitrate, 1.8% polyglycol resin QX-3812, 1.1% epoxy resin D.E.R. 732, 0.10% residue*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military and commercially operations for illuminating terrain. Like most other illumination compositions, it can be airdropped.

05-05-019A: High altitude illuminating composition for signaling, spotting, identifying and other operations:

Into a suitable and sealable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***50 grams of dry pulverized calcium metal***, followed by ***150 grams of finely divided aluminum powder***, followed by ***150 grams of barium nitrate***, and then followed by ***150 grams of potassium perchlorate***, and then seal the ball mill (to protect the mixture from moisture), and then tumble the mixture at 50 to 100 RPM for about 10 to 15 minutes to form an equal pulverized mixture. Thereafter, place the dry tumbled mixture onto a shallow pan, spread it out, and allow it to stand at room temperature for about 15 minutes in a standard room atmosphere (to allow the calcium to absorb some moisture). After 15 minutes, place the mixture into the same ball mill, previously used, and then tumble the mixture at 50 to 100 RPM for another 10 to 15 minutes. Afterwards, the mixture is ready for use. To use, it simply needs to be pressed under a pressure of about 5000 psi into tubes, containers, flare bodies, or any other desirable container. The mixture should be ignited using a standard ignition composition.
Burn rate: Average.
Light intensity: 177,000 candles per second at 100,000 feet.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: *30% potassium perchlorate, 30% aluminum powder, 30% barium nitrate, 10% calcium metal*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military and commercial operations for illuminating the sky at high altitudes for various reasons.

05-05-019B: High altitude illuminating composition for signaling, spotting, identifying and other operations (modified):

Into a suitable and sealable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***400 grams of dry pulverized calcium metal***, followed by ***50 grams of sodium nitrate***, and then followed by ***50 grams of potassium perchlorate***, and then seal the ball mill (to protect the mixture from moisture), and then tumble the mixture at 50 to 100 RPM for about 10 to 15 minutes to form an equal pulverized mixture. Thereafter, place the dry tumbled mixture onto a shallow pan, spread it out, and allow it to stand at room temperature for about 15 minutes in a standard room atmosphere (to allow the calcium to absorb some moisture). After 15 minutes, place the mixture into the same ball mill, previously used, and then tumble the mixture at 50 to 100 RPM for another 10 to 15 minutes. Afterwards, the mixture is ready for use. To use, it simply needs to be pressed under a pressure of about 5000 psi into tubes, containers, flare bodies, or any other desirable container. The mixture should be ignited using a standard ignition composition.
Burn rate: Average.
Light intensity: 343,000 candles per second at 100,000 feet
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *80% calcium metal, 10% potassium perchlorate, 10% sodium nitrate*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military and commercial operations for illuminating the sky at high altitudes for various reasons.

05-05-020A: Flickering signal flare producing radar waves and infrared radiation for use in confusing radar guided missiles/munitions, and for confusing anti-surface-to-air-missile systems used on aircraft:

Into a suitable mixing bowl, blender, ect., equipped with the usual motorized stirrer, place ***100 grams of hexachlorobenzene***, followed by ***500 milligrams of glycidyl methacrylate***, followed by ***2.5 grams of benzoyl peroxide***, followed by ***1 gram of triethyleneglycol diacrylate***, followed by ***500 milligrams of propyleneglycol monoacrylate***, followed by ***120 grams of standard powdered magnesium*** of average mesh, followed by ***50 grams of ammonium perchlorate*** of 200 microns, followed by ***25 grams of ammonium perchlorate*** of 3 microns, and then followed by ***5 grams of cesium nitrate***, and then blend the mixture on high speed for about 30 to 45 minutes to form a uniform mix. Thereafter, add in ***195.5 grams of a commercially available copolymer of Viton A*** dissolved in 1, 1, 7-tri-hydrododecafluoroheptyl acrylate, and then continue to blend the mixture for about 10 to 15 minutes to form a homogenous mixture. Afterwards, the mixture is ready to be casted. To do so, it simply needs to be poured, pressed, and vibrated into any desirable flare body, tube, fish paper tube, container, ect., under the usual conditions, and then allowed to cure at room temperature for several days. Note: heat can be used to speed up the curing process. The mixture should be ignited using a standard ignition composition.
Burn rate: 0.02 inches per second.
Oscillating range: 1.5 to 3.0 cycles per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: *39.1% Viton A copolymer, 24% magnesium, 20% hexachlorobenzene, 15% ammonium perchlorate, 1% cesium nitrate, 0.5% benzoyl peroxide, 0.2% triethyleneglycol, 0.1% glycidyl methacrylate, 0.1% propyleneglycol monoacrylate*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in land launched and air launched/dropped flares for producing radar waves for confusing radar guided weapons. Can also be fired by radar guided anti-aircraft-batteries for confusing anti-surface-to-air missiles/batteries by showering the area with said flares to produce multiple radar signals thereby confusing any land/air launched anti-aircraft-missiles (meaning missiles launched by aircraft, for example, to destroy anti-aircraft-missile batteries, can be confused and may end up hitting one of the flares rather then the missile battery—thereby providing protection to the anti-aircraft-missile batteries).

05-05-020B: Flickering signal flare producing radar waves and infrared radiation for use in confusing radar guided missiles/munitions, and for confusing anti-surface-to-air-missile systems used on aircraft (with increased radar emitions):

Into a suitable mixing bowl, blender, ect., equipped with the usual motorized stirrer, place ***100 grams of hexachlorobenzene***, followed by ***500 milligrams of glycidyl methacrylate***, followed by ***2.5 grams of benzoyl peroxide***, followed by ***1 gram of triethyleneglycol diacrylate***, followed by ***500 milligrams of propyleneglycol monoacrylate***, followed by ***120 grams of standard powdered magnesium*** of average mesh, followed by ***75 grams of sodium perchlorate*** of 3 microns, and then followed by ***5 grams of cesium nitrate***, and then blend the mixture on high speed for about 30 to 45 minutes to form a uniform mix. Thereafter, add in ***195.5 grams of a commercially available copolymer of Viton A*** dissolved in 1, 1, 7-tri-hydrododecafluoroheptyl acrylate, and then continue to blend the mixture for about 10 to 15 minutes to form a homogenous mixture. Afterwards, the mixture is ready to be casted. To do so, it simply needs to be poured, pressed, and vibrated into any desirable flare body, tube, fish paper tube, container, ect., under the usual conditions, and then allowed to cure at room temperature for several days. Note: heat can be used to speed up the curing process. The mixture should be ignited using a standard ignition composition.
Burn rate: 0.024 inches per second.
Oscillating range: 1.7 to 3.5 cycles per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: *39.1% Viton A copolymer, 24% magnesium, 20% hexachlorobenzene, 15% sodium perchlorate, 1% cesium nitrate, 0.5% benzoyl peroxide, 0.2% triethyleneglycol, 0.1% glycidyl methacrylate, 0.1% propyleneglycol monoacrylate*

Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in land launched and air launched/dropped flares for producing radar waves for confusing radar guided/tracking weapons. Can also be fired by radar guided anti-aircraft-batteries for confusing anti-surface-to-air missile/batteries by showering the area with said flares to produce multiple radar signals thereby confusing any land/air launched anti-aircraft-missiles (meaning missiles launched by aircraft, for example, to destroy anti-aircraft-missile batteries, by locking onto the radar emissions, can be confused and may end up hitting one of the flares rather then the ant-aircraft missile batteries radar site—thereby providing protection and added time to the anti-aircraft-missile batteries giving them greater chances for shooting down enemy air-craft).

05-05-021A: Smooth burning luminous flare composition:
Into a suitable mixing bowl, blender, ect., equipped with the usual motorized stirrer, place ***325 grams of finely powdered magnesium***, followed by ***175 grams of sodium nitrate***, followed by ***5 grams of cumene hydroperoxide***, and then blend the mixture on high speed for about 30 to 45 minutes to form a uniform mix. Thereafter, add in ***50 grams of a commercially available copolymer binder of polyfunctional mercaptan (Thiokol)***, and then continue to blend the mixture for about 10 to 15 minutes to form a homogenous mixture. Afterwards, the mixture is ready to be casted. To do so, it simply needs to be poured, pressed, and vibrated into any desirable flare body, tube, fish paper tube, container, ect., under the usual conditions, and then allowed to cure at room temperature for several days. The mixture should be ignited using a standard ignition composition in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.5% magnesium, 31.5% sodium nitrate, 9% copolymer binder, 0.9% cumene hydroperoxide, 0.1% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in signaling flares for the usual purposes.

05-05-022A: Increased luminosity signal composition for use in spotting:
Into a standard empty ball mill, add the following ingredients: 1. ***50 grams of zinc oxalate***, 2. ***170 grams of finely powdered magnesium***, 3. ***60 grams of finely divided aluminum***, 4. ***140 grams of calcium resinate***, and 5. ***50 grams of anhydrous zinc chloride***. Thereafter, tumble the mixture in a moisture free atmosphere (under a nitrogen atmosphere) for about 15 minutes. After 15 minutes, add in ***500 grams of strontium nitrate***, followed by ***40 grams of sodium nitrate***, and then continue to tumble the mixture for about 15 minutes at 100 RPM. Thereafter, the mixture is ready to be pressed. To do so, the mixture needs to be pressed into any desirable container, mold, fish paper tube, ect., under a pressure of about 8000 psi or more. Should be initiated using a standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.5% strontium nitrate, 16.8% magnesium, 13.8% calcium resinate, 5.9% aluminum, 4.9% zinc oxalate, 4.9% zinc chloride, 3.9% sodium nitrate, 0.30% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for spotting purposes.

05-05-023A: Signal composition for use in flares for roadwork and for traffic control:
Into a suitable mixing bowl, blender, container, equipped with a motorized stirrer in the usual means, place ***275 grams of red iron-III-oxide***, followed by ***150 grams of finely powdered magnesium***, followed by ***50 grams of barium nitrate***, followed by ***25 grams of flours of sulfur***, and then add in 100 milliliters of ether or hexane, and then blend the mixture for about 15 to 30 minutes to form a pasty mass. Once this pasty mass has been formed, it is ready to be pressed into flare bodies, and then allowed to cure for several days or so. The ignition material can be of any suitable means, and a "strike" composition should be employed for best practical results.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.

Percentage: ***55% iron-III-oxide, 30% magnesium, 10% barium nitrate, 5% sulfur***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for road flares, and other flare devices.

05-05-023B: Signal composition for use in flares for roadwork and for traffic control 2:
As in 05-05-022A, place into a suitable mixing bowl, blender, or container, equipped with a motorized stirrer in the usual means, ***150 grams of potassium dichromate***, followed by ***100 grams of strontium peroxide***, followed by ***175 grams of finely divided magnesium***, followed by ***75 grams of strontium resinate***, and then add in 100 milliliters of ether or hexane, and then blend the mixture for about 15 to 30 minutes to form a pasty mass. Once this pasty mass has been formed, it is ready to be pressed into flare bodies, and then allowed to cure for several days or so. The ignition material can be of any suitable means, and a "strike" composition should be employed for best practical results.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35% magnesium, 30% potassium dichromate, 20% strontium peroxide, 15% strontium resinate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for road flares, and other flare devices.

05-05-024A: US Army "rita" flare composition:
Place into a suitable mixing bowl, blender, or container, equipped with a motorized stirrer in the usual means, ***333.5 grams of finely divided magnesium powder***, followed by ***142.5 grams of sodium nitrate***, and then followed by ***24 grams of a standard epoxy binder***. Thereafter, blend the mixture for about 5 to 10 minutes. Thereafter, the mixture is ready to use. To use, press the mixture into any desirable container, tube, mold, ect., and then allow the devices to cure for 24 hours or so. Utilize a standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.7% magnesium, 28.5% sodium nitrate, 4.8% epoxy binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for illumination, spotting, and other purposes in the usual manner.

05-05-025A: MK 21 flare composition:
Place into a suitable mixing bowl, blender, or container, equipped with a motorized stirrer in the usual means, ***270 grams of finely divided magnesium powder***, followed by ***170 grams of sodium nitrate***, and then followed by ***60 grams of a binder called "laminae"***. Thereafter, blend the mixture for about 5 to 10 minutes. Thereafter, the mixture is ready to use. To use, press the mixture into any desirable container, tube, mold, ect., and then allow the devices to cure for 24 hours or so. Utilize a standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54% magnesium, 34% sodium nitrate, 12% binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for illumination, spotting, and other purposes in the usual manner. Can be used at very high altitudes.

05-05-026A: Yellow Naval flare composition for sea use:
Place into a suitable mixing bowl, blender, or container, equipped with a motorized stirrer in the usual means, ***105 grams of finely divided magnesium powder***, followed by ***110 grams of potassium perchlorate***, followed by ***170 grams of barium nitrate***, followed by ***155 grams of sodium oxalate***, followed by ***25 grams of asphaltum***, and then blend the mixture for about 15 minutes. Thereafter, add to the dry mixture, ***6.25 grams of a binder*** sold as "Lupersol DDM"and then blend the mixture for about 5 to 10 minutes. Thereafter, the mixture is ready to use. To use, press the mixture into any desirable container, tube, mold, ect., and then allow the

devices to cure for 24 hours or so. Heat may or may not be used to increase curing time, but the temperature should not exceed 90 Celsius. Utilize a standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% barium nitrate, 27% sodium oxalate, 19% potassium perchlorate, 18% magnesium, 4% asphaltum, 1% binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used for spotting, signaling, and guiding operations for sea use. Can be used underwater or on the water if desired.

05-05-027A: Red torch composition for multiple uses:
Into a suitable mixing bowl, place ***40 grams of nitrocellulose***, and then add in 50 milliliters of lacquer thinner. Thereafter, manually blend the mixture for about 10 minutes. Thereafter, into a clean ball mill, filled with 250 grams of Teflon coated steel shot, place ***70 grams of potassium perchlorate***, followed by ***60 grams of sulfur***, followed by ***20 grams of potassium nitrate***, followed by ***20 grams of pulverized sawdust***, followed by ***20 grams of petrolatum***, followed by ***20 grams of strontium carbonate***, and finally followed by ***70 grams of paraffin***. Thereafter, tumble the mixture at 400 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in the nitrocellulose/lacquer mixture. Finally, add in 150 milliliters of acetone, and then followed by ***450 grams strontium nitrate***, and then blend the mixture on moderate speed for about 30 minutes to form a uniform mass. Thereafter the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired tube body, container, flare body, mold, ect., under high pressure, and then cure in an oven at moderate temperature in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.44% strontium nitrate, 9.09% potassium perchlorate, 9.09% paraffin, 7.79% sulfur, 5.19% nitrocellulose, 2.59% petrolatum, 2.59% potassium nitrate, 2.59% strontium carbonate, 2.59% sawdust, 2.59% paraffin, 0.04% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in flares, for signaling, spotting, ect., in the usual means.

05-05-028A: Illumination composition for grenades:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***700 grams of magnesium powder*** of average commercially availability, and then followed by ***400 grams of Kel-F copolymer binder*** (copolymer of trifluorochloroethylene). Thereafter, mill the mixture at 250 RPM for about 2 hours. Now, place this mixture into a suitable beaker, and heat the mixture to 200 Celsius, with stirring, and then stir and heat the mixture at this temperature for about 5 to 10 minutes. Thereafter, press and vibrate the hot mixture into any desirable grenade or container body, and then allow the munitions to cool at room temperature for about 24 hours. The mixture can be fired using any desirable ignition composition in the usual manner.
Burn rate: Moderate—10 seconds per 3-gram sample.
Candle power: 40,000
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63.63% magnesium powder, 36.36% Kel-F copolymer binder, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in ground illumination devices.

05-05-029A: Illumination composition for various munitions:
Into a suitable mixing drum, equipped with motorized stirrer, place ***77.5 grams of glycidyl methacrylate***, followed by ***5 grams of ethylene dimethacrylate***, and then add in and dissolve ***77.5 grams of a liquid basic polyester resin*** (sold as CoRezyn 3, with a viscosity of 10,000), and then blend the mixture on moderate speed for about 10 minutes. Thereafter, add in ***12 grams of benzoyl peroxide*** and then continue to blend the mixture at moderate speed for about 30 minutes. Thereafter, add in ***420 grams of sodium perchlorate***, and then continue once again to blend the mixture for about 30 minutes at room temperature. Thereafter, add in ***1 gram of N,N-dimethyl-p-toluidine***, followed by ***420 grams of granulated magnesium***, and then continue to blend the mixture for about 30 minutes. Finally, the mixture is ready to be cast. To do so, the mixture needs to be poured, pressed, and vibrated into any desirable container, mold, shell, grenade body, tube, flare body, ect., in the usual manner, and the following munitions need to be cured in an oven at 65 Celsius for several hours. The munitions thereafter can then be primed with any desirable ignition composition in the usual manner.
Burn rate: Average.
Candle power: 47,000
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.46% sodium perchlorate, 41.46% granulated magnesium, 7.65% glycidyl methacrylate, 7.65% liquid basic polyester resin, 1.18% benzoyl peroxide cure catalyst, 0.493% ethylene dimethacrylate, 0.098% N,N-dimethyl-p-toluidine curing agent, 0.009% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in ground illumination, and aerial devices.

05-05-030A: Illumination/photoflash composition for high altitude operations:
Into a suitable ball mill, or rotating device, filled with Teflon coated steel shot of the usual size and weight, place ***300 grams of potassium perchlorate***, followed by ***100 grams of aluminum powder***, followed by ***300 grams of barium nitrate***. Thereafter, tumble the mixture at 250 RPM for about 1 hour to form a uniform powder. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and inert atmosphere, and then add in 250 milliliters of hexane, and then followed by ***300 grams of calcium metal powder*** of average commercial mesh, and then blend the mixture for about 50 minutes at room temperature and under vacuum (to remove the solvent). Note: all the solvent needs to be removed before pressing. Thereafter, the mixture is ready to be pressed. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under high pressure (10,000 psi minimum), in the usual manner. The mixture should be primed in the usual manner.
Burn rate: Average.
Candle power: 116,000 at 100,000 feet altitude.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% potassium perchlorate, 30% barium nitrate, 30% calcium metal powder, 10% aluminum powder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in high altitude flares for various operations.

05-05-030B: Illumination/photoflash composition for high altitude operations:
Into a suitable ball mill, or rotating device, filled with Teflon coated steel shot of the usual size and weight, place ***590 grams of sodium nitrate***, followed by ***410 grams of magnesium powder***, followed by ***500 grams of barium nitrate***. Thereafter, tumble the mixture at 250 RPM for about 1 hour to form a uniform powder. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and inert atmosphere, and then add in 375 milliliters of hexane, and then followed by ***300 grams of calcium metal powder*** of average commercial mesh, and then followed by ***150 grams of aluminum powder***, and then blend the mixture for about 50 minutes at room temperature and under vacuum (to remove the solvent). Note: all the solvent needs to be removed before pressing. Thereafter, the mixture is ready to be pressed. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under high pressure (10,000 psi minimum), in the usual manner. The mixture should be primed in the usual manner.
Burn rate: Average.
Candle power: estimated at 98,000 at 100,000 feet altitude.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.

Percentage: ***30.25% sodium nitrate, 25.64% barium nitrate, 21% magnesium powder, 15.38% calcium metal, 7.69% aluminum powder, 0.04% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in high altitude flares for various operations.

05-05-031A: Illumination/photoflash composition for ground and high altitude operations:
Into a suitable mixing bowl, equipped with motorized stirrer, place 175 milliliters of ether, and then add in ***400 grams of sodium perchlorate,*** and then followed by ***600 grams of calcium metal powder.*** Thereafter, blend the mixture for about 30 minutes at room temperature. Thereafter, the mixture is ready to be pressed. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under high pressure (10,000 psi minimum), in the usual manner, and then the resulting munitions need to be cured in an oven at moderate temperature. Note: the ovens used should be fitted with an inert atmosphere to exclude oxygen and moisture. The mixture can be primed in the usual manner.
Burn rate: Average.
Candle power: 60,000 at sea level; 214,000 photoflash at 100,000 feet altitude.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% calcium metal powder, 40% sodium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in high altitude photoflash flares for various operations, and used for ground illumination operations.

05-05-032A: Self-hardening illumination composition for various operations:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***175 grams of sodium nitrate,*** followed by ***325 grams of magnesium metal powder,*** followed by ***50 grams of polyfunctional Mercaptan binder*** (available from Thiokol corporation), and then followed by ***5 grams of cumene hydroperoxide.*** Thereafter, blend the mixture for about 30 minutes at room temperature. Thereafter, the mixture is ready to be formed. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under mild pressure. Thereafter, the resulting munitions need to be cured in an airtight container or similar device at room temperature. The mixture can be primed in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.55% magnesium powder, 31.53% sodium nitrate, 9% Mercaptan binder, 0.90% cumene hydroperoxide, 0.02% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in various operations for ground and air illumination and signaling.

05-05-032B: Self-hardening illumination composition for various operations:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***175 grams of barium nitrate,*** followed by ***325 grams of magnesium metal powder,*** followed by ***50 grams of any desired polyester compound,*** and then followed by ***250 milligrams of benzoyl peroxide.*** Thereafter, blend the mixture for about 45 minutes at room temperature. Thereafter, the mixture is ready to be formed. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under mild pressure. Thereafter, the resulting munitions need to be cured in an airtight container or similar device at room temperature. The mixture can be primed in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***59.06% magnesium powder, 31.8% barium nitrate, 9.08% polyester binder, 0.045% benzoyl peroxide, 0.015% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used in various operations for ground and air illumination and signaling.

05-05-032C: Self-hardening illumination composition for various operations with reddish tint:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***175 grams of strontium nitrate,*** followed by ***325 grams of magnesium metal powder,*** followed by ***50 grams of dichlorostyrene monomeric,*** followed by ***1.25 grams of benzoyl peroxide,*** and then followed by ***1.25 grams of stannic chloride anhydrous.*** Thereafter, blend the mixture for about 45 minutes at room temperature. Thereafter, the mixture is ready to be formed. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under mild pressure. Thereafter, the resulting munitions need to be cured in an airtight container or similar device at room temperature. The mixture can be primed in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.82% magnesium powder, 31.67% strontium nitrate, 9% dichlorostyrene binder, 0.226% benzoyl peroxide, 0.226% stannic chloride catalyst, 0.058% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in various operations for ground and air illumination and signaling.

05-05-033A: Illumination composition for various operations:
Into a suitable ball mill, or vertical mixer, place ***250 grams of magnesium powder*** of 200 mesh, followed by ***14 grams of magnesium oxide (heavy),*** and then followed by ***213.5 grams of sodium nitrate.*** Thereafter, tumble or rotate the mixture under high RPM for about 2 hours. Thereafter, place this rotated mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***22.5 grams of polyvinyl acetate,*** and then blend the mixture at moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to be cast. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under mild pressure. Thereafter, the resulting munitions need to be cured in an oven at moderate temperature in the usual manner. The mixture can be primed in the usual manner.
Burn rate: 2.2 seconds per small sample.
Candle power: 700,000.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% magnesium powder, 42.7% sodium nitrate, 4.5% polyvinyl acetate, 2.8% magnesium oxide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in sky illumination flares from hand-held devices, mortars, or artillery delivery systems.

05-05-033B: Reduced illumination composition for use in enclosed areas:
Into a suitable ball mill, or vertical mixer, place ***250 grams of magnesium powder*** of 200 mesh, and then followed by ***213.5 grams of sodium nitrate.*** Thereafter, tumble or rotate the mixture under high RPM for about 2 hours. Thereafter, place this rotated mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***36.5 grams of polyvinyl acetate,*** and then blend the mixture at moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to be cast. To do so, the mixture needs to be pressed into any desirable container, mold, tube, flare body, ect., under mild pressure. Thereafter, the resulting munitions need to be cured in an oven at moderate temperature in the usual manner. The mixture can be primed in the usual manner.
Burn rate: 9.3 seconds per small sample.
Candle power: 100,000.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% magnesium powder, 42.7% sodium nitrate, 7.3% polyvinyl acetate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for indoor illumination purposes such as caves, tunnels, and bunkers.

05-05-034A: Brilliant red signal/flare compound (single component composition):

Into a clean beaker, place ***280 grams of hexamine***, and then add in 1400 milliliters of distilled water. Thereafter, blend the entire mixture to dissolve the hexamine. Thereafter, quickly filter the mixture, and then set it aside for a moment. Thereafter, into a separate clean beaker or similar container, place ***474 gram of strontium nitrate***, and then add in 3000 milliliters of distilled water. Thereafter, blend this mixture to dissolve the strontium nitrate. Thereafter, quickly filter this mixture. Now, place the hexamine solution into an ice bath, and chill to 0 Celsius. Thereafter, slowly add in, in small portions at a time, the nitrate solution while blending the hexamine solution on moderate speed over a period of about 30 to 45 minutes. After the addition, continue to blend the combined mixture on moderate speed for about 30 minutes at 0 Celsius. Thereafter, remove the ice bath, and then pour the entire mixture onto a shallow pan or try, with a high surface area, and then allow the water to fully evaporate until dry solid remains. Thereafter, collect the dried solid that remains behind, and then place it into a clean ball mill, filled with 200 grams of Teflon coated steel shot. Thereafter, tumble the mixture at 75 RPM for about 15 to 20 minutes. Thereafter, remove the compound and separate it form the steel shot in the usual manner. Now, the compound is ready for use. To use, it simply needs to be moistened with a little ethyl acetate, or ether to form a paste, and then this paste needs to be pressed into any desired flare body, container, tube, ect., under pressure in the usual manner, and the resulting devices then cured in an oven at low temperature until dry and hard.
Burn rate: Unknown.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***99% hexamine/strontium nitrate complex, 1% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signaling, spotting, and similar operations.

05-05-034B: Brilliant voluminous red signal/flare compound:

Into a clean beaker, place ***280 grams of hexamine***, and then add in 1400 milliliters of distilled water. Thereafter, blend the entire mixture to dissolve the hexamine. Thereafter, quickly filter the mixture, and then set it aside for a moment. Thereafter, into a separate clean beaker or similar container, place ***474 gram of strontium nitrate***, and then add in 3000 milliliters of distilled water. Thereafter, blend this mixture to dissolve the strontium nitrate. Thereafter, quickly filter this mixture. Now, place the hexamine solution into an ice bath, and chill to 0 Celsius. Thereafter, slowly add in, in small portions at a time, the nitrate solution while blending the hexamine solution on moderate speed over a period of about 30 to 45 minutes. After the addition, continue to blend the combined mixture on moderate speed for about 30 minutes at 0 Celsius. Thereafter, remove the ice bath, and then pour the entire mixture onto a shallow pan or try, with a high surface area, and then allow the water to fully evaporate until dry solid remains. Thereafter, collect the dried solid that remains behind, and then place it into a clean ball mill, filled with 250 grams of Teflon coated steel shot. Thereafter, add in ***100 grams of magnesium powder*** of average mesh, followed by ***50 grams of powdered graphite***, and then followed by ***5 grams of mercury-II-chloride***, and then tumble the mixture at 175 RPM for about 15 to 20 minutes. Thereafter, remove the mixture and separate it from the steel shot in the usual manner. Now, the mixture is ready for use. To use, it simply needs to be moistened with a little ethyl acetate, or ether to form a paste, and then this paste needs to be pressed into any desired flare body, container, tube, ect., under pressure in the usual manner, and the resulting devices then cured in an oven at low temperature until dry and hard.
Burn rate: Unknown.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***82.94% hexamine/nitrate complex salt, 11% magnesium powder, 5.5% graphite, 0.55% mercury-II-chloride, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signaling, spotting, and similar operations.

05-05-035A: Signaling composition with dense smoke effect:

Into a suitable ball mill or rotating machine, place ***50 grams of magnesium powder*** of average mesh, followed by ***50 grams of aluminum powder*** of average mesh, and then followed by ***10 grams of pre-boiled linseed oil***. Thereafter, tumble the mixture at 75 RPM for about 1 hour to coat the metals with the oil. Thereafter, add in ***30 grams of zinc oxide***, followed by ***500 grams of red phosphorus***, and then followed by ***350 grams of manganese dioxide***. Thereafter, continue to tumble the mixture at 200 RPM for about 2 hours at room temperature. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired flare body, container, tube, ect., under high pressure. The composition needs to be primed with any desired smoke ignition composition.

Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50.5% red phosphorus, 35.35% manganese dioxide, 5.05% magnesium powder, 5.05% aluminum powder, 3.03% zinc oxide, 1.01% linseed oil coating, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signaling, spotting, and similar operations where smoke is desired.

05-05-036A: Signaling composition with shower spark effect:

Into a suitable ball mill or rotating machine, place ***150 grams of zirconium powder*** of average mesh, followed by ***75 grams of coarse zirconium metal grains***, and then followed by ***50 grams of zirconium carbonate***. Thereafter, tumble the mixture at 175 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 150 milliliters of acetone, and then followed by ***200 grams of ammonium perchlorate***. Thereafter, blend the mixture on high speed for about 2 hours at room temperature. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired flare body, container, tube, ect., under high pressure, and then dried in an oven at ordinary temperature in the usual manner.
Burn rate: Unknown—most likely typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Unknown.
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.1% ammonium perchlorate, 31.57% zirconium metal powder, 15.78% coarse zirconium metal, 10.52% zirconium carbonate, 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signaling, spotting, and similar operations where a shower of sparks is desired to improve view ability.

05-05-037A: Smokeless and ashless signal flare composition:

Into a suitable empty ball mill or vertical mixer, place ***55.5 grams of copper dust***, followed by ***55.5 grams of stearic acid***. Thereafter, tumble or rotate the mixture at 100 RPM or so, for about 15 minutes. Thereafter, place this mixture into a clean mixing bowl, equipped with motorized stirrer, and then add in ***18 grams of paraffin***, and then followed by ***371 grams of ammonium perchlorate***. Thereafter, add in 100 milliliters of acetone, and then blend the mixture on moderate speed until the acetone evaporates. Note: a vacuum can be used to capture the solvent. Thereafter, place the mass into a clean ball mill, filled with Teflon coated steel shot, and then tumble the mixture at 250 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into any desirable flare body, tube, container, ect., under high pressure in the usual manner.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years—but may absorb moisture on excessive storage.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***74.2% ammonium perchlorate, 11.1% stearic acid, 11.1% copper dust, 3.6% paraffin***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: used in flares for the usual means.

05-05-038A: "Red light" signal flare composition:

Into a suitable ball mill, filled with about 500 grams of Teflon coated steel shot, place ***150 grams of finely ground softwood charcoal***, followed by ***2500 grams of potassium chlorate***, and then followed by ***2500 grams of strontium nitrate***. Thereafter, tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this tumbled mixture into any desired mixing drum, bowl, ect., equipped with motorized stirrer in the usual manner, and then add in ***750 grams of linseed glue***. Thereafter, blend the mixture on moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allow the munitions to cure at room temperature for at least 48 hours to ensure the mixture is dry and hard.
Burn rate: Typical for signals.
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.37% strontium nitrate, 42.37% potassium chlorate, 12.71% linseed glue, 2.54% softwood charcoal, 0.01% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signals, spotting, ect.

05-05-038B: "White light" signal flare composition:
Into a suitable ball mill, filled with about 500 grams of Teflon coated steel shot, place ***500 grams of finely ground white chalk***, followed by ***5000 grams of potassium chlorate***, and then followed by ***2000 grams of barium nitrate***. Thereafter, tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this tumbled mixture into any desired mixing drum, bowl, ect., equipped with motorized stirrer in the usual manner, and then add in ***1000 grams of linseed glue***. Thereafter, blend the mixture on moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allow the munitions to cure at room temperature for at least 48 hours to ensure the mixture is dry and hard.
Burn rate: Typical for signals.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.82% potassium chlorate, 23.52% barium nitrate, 11.76% linseed glue, 5.88% white chalk, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signals, spotting, ect.

05-05-038C: "Blue light" signal flare composition:
Into a suitable ball mill, filled with about 500 grams of Teflon coated steel shot, place ***2000 grams of potassium chlorate***, and then followed by ***400 grams of copper-II-oxychloride***. Thereafter, tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this tumbled mixture into any desired mixing drum, bowl, ect., equipped with motorized stirrer in the usual manner, and then add in ***300 grams of linseed glue***. Thereafter, blend the mixture on moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allow the munitions to cure at room temperature for at least 48 hours to ensure the mixture is dry and hard.
Burn rate: Typical for signals.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***74.07% potassium chlorate, 14.81% copper oxychloride, 11.11% linseed glue, 0.01% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signals, spotting, ect.

05-05-038D: "Green light" signal flare composition:
Into a suitable ball mill, filled with about 500 grams of Teflon coated steel shot, place ***2500 grams of barium chloride***, and then followed by ***1250 grams of barium nitrate***. Thereafter, tumble the mixture at 300 RPM for about 1 hour. Thereafter, place this tumbled mixture into any desired mixing drum, bowl, ect., equipped with motorized stirrer in the usual manner, and then add in ***600 grams of linseed glue***. Thereafter, blend the mixture on moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allow the munitions to cure at room temperature for at least 48 hours to ensure the mixture is dry and hard.
Burn rate: Typical for signals.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4+

Tendency to cake: None.
Explosive ability: None.
Percentage: ***57.47% barium chloride, 28.73% barium nitrate, 13.79% linseed glue, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signals, spotting, ect.

05-05-038E: "Yellow light" signal flare composition:
Into a suitable ball mill, filled with about 500 grams of Teflon coated steel shot, place ***5000 grams of potassium chlorate***, followed by ***1000 grams of sodium oxalate***, and then followed by ***150 grams of finely ground soft wood charcoal***. Thereafter, tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this tumbled mixture into any desired mixing drum, bowl, ect., equipped with motorized stirrer in the usual manner, and then add in ***750 grams of linseed glue***. Thereafter, blend the mixture on moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allow the munitions to cure at room temperature for at least 48 hours to ensure the mixture is dry and hard.
Burn rate: Typical for signals.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.46% potassium chlorate, 14.49% sodium oxalate, 10.86% linseed glue, 2.17% soft wood charcoal, 0.02% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signals, spotting, ect.

05-05-038F: "Rose colored light" signal flare composition:
Into a suitable ball mill, filled with about 500 grams of Teflon coated steel shot, place ***5000 grams of potassium chlorate***, and then followed by ***1250 grams of white chalk***. Thereafter, tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this tumbled mixture into any desired mixing drum, bowl, ect., equipped with motorized stirrer in the usual manner, and then add in ***750 grams of linseed glue***. Thereafter, blend the mixture on moderate speed for about 30 minutes in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allow the munitions to cure at room temperature for at least 48 hours to ensure the mixture is dry and hard.
Burn rate: Typical for signals.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***71.42% potassium chlorate, 17.85% white chalk, 10.71% linseed glue, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for signals, spotting, ect.

05-05-039A: Naval green signal flare composition for marine use:
Into a suitable empty ball mill, or vertical mixer, place ***86.4 grams of magnesium powder***, followed by ***124.6 grams of potassium perchlorate***, followed by ***170 grams of barium nitrate***, followed by ***80 grams of PVC powder***, and then followed by ***21.25 grams of a binder mixture*** called "Laminac 4110". Thereafter, tumble the mixture at 250 RPM for about 1 hour in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture simply needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allowed to cure at nominal temperature for at least 24 hours.
Burn rate: Typical for signals.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35.25% barium nitrate, 25.83% potassium perchlorate, 17.91% magnesium powder, 16.58% PVC powder, 4.4% binder mixture, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Widely used for signals, spotting, ect., for military operations at sea.

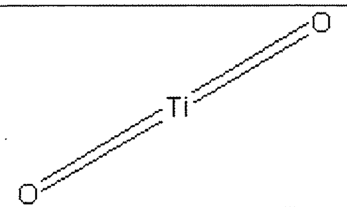
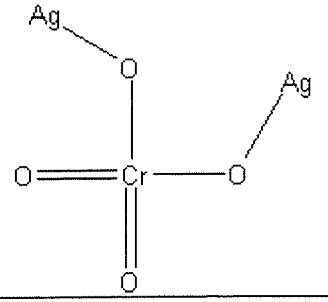
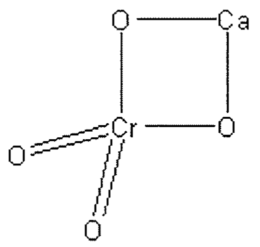
05-05-039B: Naval yellow signal flare composition for marine use:
Into a suitable empty ball mill, or vertical mixer, place ***105 grams of magnesium powder***, followed by ***110 grams of potassium perchlorate***, followed by ***170 grams of barium nitrate***, followed by ***155 grams of sodium oxalate***, and then followed by ***25 grams of asphaltum,*** and then followed by ***21.25 grams of a binder called*** "Laminac 4110". Thereafter, tumble the mixture at 250 RPM for about 1 hour in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture simply needs to be pressed into any desirable flare body, tube, container, ect., in the usual manner, and then allowed to cure at nominal temperature for at least 24 hours.
Burn rate: Typical for signals.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***28.99% barium nitrate, 26.43% sodium oxalate, 18.76% potassium perchlorate, 17.91% magnesium powder, 4.26% asphaltum, 3.62% binder mixture, 0.03% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Widely used for signals, spotting, ect., for military operations at sea.

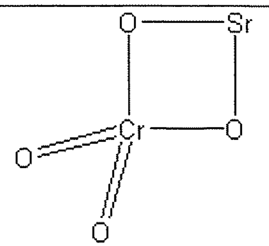
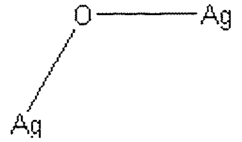
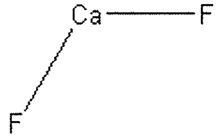
Section 6: Pyrotechnic Delay Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun	**70. Calcium Hydride (see Ammonium Nitrate Gun**

Propellants)		**Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)		**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)		**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)		**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)		**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)		**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)		**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)		**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)		**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)		**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)		**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)		**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)		**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)		**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)		**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)		**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)		**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)		**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)		**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)		**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)		**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)		**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)		**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)		**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)		**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)		**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)		**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)		**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)		**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)		**129. Bismuth Subnitrate (see Smoke Generating Compositions)**
130. Calcium Iodate (see Smoke Generating Compositions)		**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)		**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)		**135. Potassium Ferricyanide (see Priming/Igniter Compositions)**
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)		**137. Bismuth Trioxide (see Priming/Igniter Compositions)**
138. Titanium powder (see Priming/Igniter Compositions)		**139. Tungsten powder (see Priming/Igniter Compositions)**
140. Lead Powder (see Priming/Igniter Compositions)		**141. Lead-II-Oxide (red lead; litharge) (see Priming/Igniter Compositions)**
142. Selenium powder (see Priming/Igniter Compositions)		**143. Sodium Bicarbonate (see Priming/Igniter Compositions)**
144. Iron powder (see Priming/Igniter Compositions)		**145. Silicon Dioxide (see Priming/Igniter Compositions)**
146. Lead Thiocyanate (see Priming/Igniter Compositions)		**147. Para-Nitrotoluene (see Priming/Igniter Compositions)**

148. Silver powder (see Priming/Igniter Compositions)		**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)		**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)		**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)		**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)		**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)		**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate (see Illumination/Flare and Signaling Compositions)		**161. Iodoform (see Illumination/Flare and Signaling Compositions)**
162. Lithium Nitrate (see Illumination/Flare and Signaling Compositions)		**163. Manganese Oxide (see Illumination/Flare and Signaling Compositions)**
164. Sodium Carbonate (see Illumination/Flare and Signaling Compositions)		**165. Molybdenum powder (see Illumination/Flare and Signaling Compositions)**
166. Sodium Oxalate (see Illumination/Flare and Signaling Compositions)		**167. Oxalic Acid (see Illumination/Flare and Signaling Compositions)**
168. Stearic acid (see Illumination/Flare and Signaling Compositions)		**169. Thorium Nitrate (see Illumination/Flare and Signaling Compositions)**
170. Cerium Nitrate (see Illumination/Flare and Signaling Compositions)		**171. Rubidium Nitrate (see Illumination/Flare and Signaling Compositions)**
172. Calcium metal (see Illumination/Flare and Signaling Compositions)		**173. Mercury-II-Chloride (see Illumination/Flare and Signaling Compositions)**
174. Zirconium Carbonate (see Illumination/Flare and Signaling Compositions)		**175. Barium Chloride (see Illumination/Flare and Signaling Compositions)**
176. Antimony powder		**177. Chromium metal**
$Sb \equiv Sb$		$Cr \equiv Cr$
Forms silvery-white to grayish white solid. The powder is usually a dark color. The powder is stable at room temperature, but will oxidize on prolonged standing in moist air.		Forms a brilliant bluish-white to grayish white powder. The powder is stable in air, and will resist much chemical attack. The powder is however soluble in acids with the evolution of hydrogen gas.
178. Zinc powder		**179. Tin Dioxide**
$Zn = Zn$		
Zinc forms a dark gray powder, but may be bluish gray in color. Zinc powder is very reactive and tarnishes in the air. Commercial grades will already be tarnished. The powder is insoluble in water and the usual solvents. The powder readily converts to the oxide when heated. Use caution, as zinc powder can react vigorously with acids and bases.		Forms a white to grayish powder. The powder is very stable and insoluble in water and most solvents. The solid is very resistant to acids in the cold.
180. Silver-I-Chromate		**181. Calcium Chromate**
		
Forms a dark reddish-brown powder, granules, or lumps. The crystals are soluble in water. Keep the solid stored in amber glass bottles in a cool dry place.		Forms beautiful yellow crystals, granules, or powder. The powder is insoluble in water and alcohol.
182. Strontium Chromate		**183. Silver-I-Oxide**

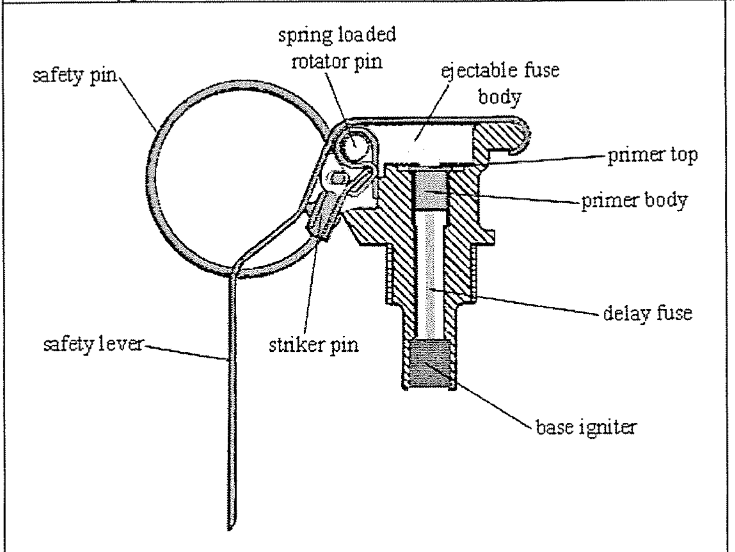
		
Forms a yellow powder. The powder is insoluble in water and alcohol. The powder is freely soluble in dilute hydrochloric acid solutions.		Forms a brownish black powder. The salt begins to decompose when heated to 200 Celsius. Silver oxide is light sensitive so store in amber glass bottles in a light free environment. The powder is insoluble in water and alcohol.
184. Calcium Fluoride		
		
Forms colorless crystals or white granules or powder. The crystals have a melting point of 1400 Celsius. Calcium fluoride is insoluble in water and all known organic solvents. The powder decomposes slowly in the presence of strong acids forming hydrogen fluoride.		

- Pyrotechnic Delay Compositions in this section -

1. 05-06-001A: Pyrotechnic delay composition for detonators: *42% lead-VI-chromate, 42% lead-II-oxide, 15% silicon, 1% linseed oil*	**2. 05-06-002A: "Gasless" pyrotechnic delay element for detonators and fuses:** *35% manganese, 34% lead chromate, 31% barium chromate,*
3. 05-06-003A: Slag producing delay element for black powder charges: *80% chromium metal, 10% potassium perchlorate, 10% barium chromate*	**4. 05-06-003B: Slag producing delay element for black powder charges (modified):** *80% molybdenum, 10% potassium perchlorate, 10% barium chromate*
5. 05-06-003C: Slag producing delay element for black powder charges (modified 2): *58.9% barium chromate, 26.6% tungsten metal, 9.5% potassium perchlorate, 5% diatomaceous earth*	**6. 05-06-004A: Pyrotechnic delay composition for detonators:** *59% potassium permanganate, 40% antimony, 1% silicon*
7. 05-06-005A: Pyrotechnic delay composition for pyrotechnic munitions, fuses, and other means: *44% lead-II-oxide, 39% lead-VI-chromate, 16% silicon, 1% linseed oil*	**8. 05-06-005B: Pyrotechnic delay composition for pyrotechnic munitions, fuses, and other means (with decreased burn rate):** *88% lead-VI-chromate, 10% silicon, 1% aluminum, 1% linseed oil*
9. 05-06-006A: Pyrotechnic delay composition for use in blasting caps and detonators: *66.3% lead tetraoxide, 25.7% silicon, 5.5% mischmetal, 2.3% aluminum, 0.20% mixed impurities*	**10. 05-06-006B: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate):** *66.3% lead tetraoxide, 25.7% silicon, 5.5% mischmetal, 2.3% copper, 0.20% mixed impurities*
11. 05-06-006C: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate): *66.3% lead tetraoxide, 25.7% silicon, 5.5% mischmetal, 2.3% tin, 0.20% mixed impurities*	**12. 05-06-007A: Pyrotechnic delay composition for use in blasting caps and detonators:** *45.1% silicon, 29.8% potassium permanganate, 17.5% mischmetal, 7.5% magnesium, 0.10% mixed impurities*
13. 05-06-007B: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate): *43.8% silicon, 31.8% manganese dioxide, 17% mischmetal, 7.3% magnesium, 0.10% mixed impurities*	**14. 05-06-007C: Pyrotechnic delay composition for use in blasting caps and detonators:** *43% lead dioxide, 27.3% silicon, 14.5% lead-VI-chromate, 7.6% mischmetal, 7.6% magnesium*
15. 05-06-007D: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate): *39.7% silicon, 24.1% barium nitrate, 14.1 lead dioxide, 11% mischmetal, 11% magnesium, 0.10% mixed impurities*	**16. 05-06-007E: Pyrotechnic delay composition for use in blasting caps and detonators with increased burn rate:** *61.5% lead tetraoxide, 31.5% silicon, 5% mischmetal, 1.8% magnesium, 0.20% mixed impurities*
17. 05-06-008A: Pyrotechnic delay composition for use in blasting caps and detonators: *62.5% lead tetraoxide, 24% silicon, 13.4% magnesium, 0.10% mixed impurities*	**18. 05-06-009A: Standard pyrotechnic delay composition for use in blasting caps and detonators:** *80% lead tetraoxide, 20% silicon*
19. 05-06-009B: Standard pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate): *93% lead tetraoxide, 7% silicon*	**20. 05-06-010A: Standard slow burning pyrotechnic delay composition for use in blasting caps and detonators:** *36% lead tetraoxide, 35.9% lead-VI-chromate, 20.3% barium chromate, 6.2% silicon, 1.6% selenium*
21. 05-06-011A: Pyrotechnic delay composition for use in blasting caps and detonators: *67.5% barium peroxide, 22.5% selenium, 8.4% lead, 1.5% tin, 0.1% mixed impurities or equivalent*	**22. 05-06-012A: Pyrotechnic delay composition for use in blasting caps and detonators:** *49.1% potassium permanganate, 40.7% zinc, 5.4% metal alloy, 4.7% silicon, 0.10% balanced material*
23. 05-06-012A: Pyrotechnic delay composition for use in blasting caps and detonators: *49.1% potassium permanganate, 40.7% zinc, 5.4% metal alloy, 4.7% silicon, 0.10% balanced material*	**24. 05-06-012B: Pyrotechnic delay composition for use in blasting caps and detonators (modified—metal alloy free):** *51.9% potassium permanganate, 43% zinc, 4.9% silicon, 0.2% balanced material*
25. 05-06-012C: Pyrotechnic delay composition for use in blasting caps and detonators (permanganate free): *50% metal alloy, 50% lead tetraoxide*	**26. 05-06-013A: Pyrotechnic delay composition for use in blasting caps and detonators (nitrocellulose reinforced):** *35.7% lead dioxide, 33.7% copper metal, 29.7% silicon, 0.82% nitrocellulose, 0.08% balanced ingredients*
27. 05-06-014A: Pyrotechnic delay composition for use grenade fuses (activated by primer): *52% aluminum/magnesium alloy, 47% barium nitrate, 1% castor oil*	**28. 05-06-014B: Pyrotechnic delay composition for use grenade fuses (activated by primer), modified:** *47% barium nitrate, 17.3% copper metal, 17.3% silicon, 17.3% zinc, 1% castor oil, 0.10% balance*
29. 05-06-015A: Pyrotechnic delay composition for use in fuses for various military devices: *47% bismuth trioxide, 20% tin dioxide, 15% antimony, 13% zirconium/nickel alloy, 5% potassium perchlorate*	**30. 05-06-015B: Pyrotechnic delay composition for use in fuses for various military devices (decreased burn rate):** *55% bismuth trioxide, 20% tin dioxide, 10% antimony, 10% zirconium/nickel alloy, 5% potassium perchlorate*
31. 05-06-015C: Pyrotechnic delay composition for use in fuses for various military devices (decreased burn rate): *50% tin dioxide, 31% titanium dioxide, 10% antimony, 5% potassium perchlorate, 4% boron*	**32. 05-06-016A: Moldable pyrotechnic delay composition for use in fuses:** *44% potassium perchlorate, 28% Dapon prepolymer, 11% red lead oxide, 7% calcium silicide, 7% boron, 1.36% moisture, 1% diallyl phthalate monomer, 0.57% calcium stearate, 0.57% butylperbenzoate, 0.07% zulu blue dye*
33. 05-06-017A: Pyrotechnic delay composition for use in fuses: *84.9% barium peroxide, 14.9% selenium metal, 0.2% nitrocellulose*	**34. 05-06-018A: Pyrotechnic delay composition for multiple uses:** *45% sodium azide, 45% silicon powder, 10% barium nitrate*
35. 05-06-018B: Pyrotechnic delay composition for multiple uses: *45% potassium azide, 45% magnesium powder, 10% potassium perchlorate*	**36. 05-06-019A: Pyrotechnic delay composition for multiple uses:** *98% silver-I-chromate, 2% red phosphorus*
37. 05-06-019B: Pyrotechnic delay composition for multiple uses: *90% calcium chromate, 10% red phosphorus*	**38. 05-06-020A: Pyrotechnic delay composition for multiple uses:** *62.93% red iron oxide, 10.48% red phosphorus, 10.48% sodium chlorate, 6.99% sodium hypophosphite, 6.99% sodium chloride, 2.09% copper-II-oxide, 0.04% mixed balance*
39. 05-06-021A: Pyrotechnic delay composition for multiple uses: *46.63% barium peroxide, 31.08% strontium chromate, 10.36% red phosphorus, 9.32% food starch, 2.59% silver-I-oxide, 0.02% mixed residual balance*	**40. 05-06-022A: Gasless pyrotechnic delay composition for multiple uses:** *90% barium chromate, 5% zirconium powder, 5% sulfur*
41. 05-06-022B: Gasless pyrotechnic delay composition for multiple uses: *80% strontium chromate, 16% manganese, 4% sulfur*	**42. 05-06-022C: Gasless pyrotechnic delay composition for multiple uses:** *74% barium chromate, 24% manganese metal, 2% red phosphorus*
43. 05-06-023A: Gasless pyrotechnic delay composition for multiple uses: *40% copper oxide, 27.5% manganese, 22.5% red iron oxide, 5% sulfur, 5% red phosphorus*	**44. 05-06-023B: Gasless pyrotechnic delay composition for multiple uses:** *30% barium peroxide, 25% silver-I-oxide, 12.5% iron powder, 12.5% red phosphorus, 12.5% chromium metal powder, 7.5% sulfur,*
45. 05-06-024A: Gasless pyrotechnic delay composition for multiple uses: *74.35% barium peroxide, 17.09% potassium nitrate, 5.12% silicon, 3.41% graphite powder, 0.03% mixed balance*	**46. 05-06-024B: Gasless pyrotechnic delay composition for multiple uses:** *79.5% barium peroxide, 6% nitrocellulose, 5.6% potassium nitrate, 5.6% silicon, 2.8% graphite, 0.5% aluminum stearate*
47. 05-06-025A: Pyrotechnic delay composition for use in multi stage rockets: *80% chromium metal, 10% barium chromate, 10% potassium perchlorate*	**48. 05-06-025B: Pyrotechnic delay composition for use in multi stage rockets:** *50% chromium metal, 25% barium chromate, 25% potassium perchlorate*
49. 05-06-025C: Pyrotechnic delay composition for use in multi stage rockets: *52.25% barium chromate, 33.25% molybdenum powder, 9.5% potassium perchlorate, 5% diatomaceous earth*	**50. 05-06-025D: Pyrotechnic delay composition for use in multi stage rockets:** *49.5% finely ground tungsten, 36% barium chromate, 10% calcined diatomaceous earth, 4.5% potassium perchlorate*

51. 05-06-026A: Pyrotechnic delay composition for various operations: *60% barium chromate, 24% tungsten powder, 10% potassium perchlorate, 3% calcium fluoride, 3% diatomaceous earth*	**52. 05-06-027A: Pyrotechnic delay composition for various operations:** *48.5% barium chromate, 35% tungsten powder, 10% potassium perchlorate, 5% diatomaceous earth, 1.5% zinc stearate*
53. 05-06-028A: Pyrotechnic delay composition for use at high altitudes for initiating flares, smoke, and rocket compositions: *70.87% zirconium metal, 19.41% sulfur, 4.85% nitrocellulose, 4.85% potassium perchlorate, 0.02% residual balance*	

05-06-001A: Pyrotechnic delay composition for detonators:
Into a suitable ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***75 grams of finely ground silicon powder***, followed by ***5 grams of linseed oil.*** Thereafter, tumble the mixture thoroughly at 150 RPM for about 2 hours. After 2 hours, throw in ***210 grams of lead-II-oxide,*** followed by ***210 grams of lead-VI-Chromate***, and then continue to tumble the mixture at 150 RPM for 1 hour. Afterwards, the mixture is ready to go. To use, it needs to be pressed into tubes or molds of any desirable size and material under a pressure of about 2000 psi. The tubes should then be cured for several days.
Burn rate: 26 seconds when using 1/4th inch diameter by 3-inch length fuse tubes.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42% lead-VI-chromate, 42% lead-II-oxide, 15% silicon, 1% linseed oil***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as a delay element in detonators for missiles and bombs.

Typical mechanical/chemical fuse for grenades	Description
 spring loaded rotator pin safety pin ejectable fuse body primer top primer body delay fuse safety lever striker pin base igniter	A standard grenade fuze works using a spring-loaded striker pin, held in place by a safety pin. When the safety pin is released, and pressure upon the safety lever released, the spring-loaded striker pin rotates around and over, striking a primer. The primer ignites a black powder delay fuse, which burns down to the base igniter. The base igniter acts upon a booster and base charge, (for HE), or upon an ignition charge for smoke or incendiary devices.

05-06-002A: "Gasless" pyrotechnic delay element for detonators and fuses:
Into a suitable blender or mixer equipped with plastic stirring blade, place 75 milliliters of carbon tetrachloride, followed by ***175 grams of powdered manganese*** of 325 mesh, and then blend the mixture on low for about 30 minutes at room temperature. After 30 minutes, throw in ***170 grams of lead chromate*** of 200 mesh, followed by ***155 grams of barium chromate*** of 325 mesh, and then continue blending the mixture on low for 1 hour at room temperature. After the mixing operation, place the mixture onto a shallow pan and allow it to thoroughly air-dry for several days or so. Thereafter, place the dried mass into a clean ball mill filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform mixture. After the one-hour tumbling operation, the powder is ready for use. To use, it needs to be pressed into any desirable container, tube, mold ect., ect., under high pressure (10,000 psi).
Burn rate: Moderate
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾

Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35% manganese, 34% lead chromate, 31% barium chromate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in detonators and fuses for grenades, and a wide variety of munitions.

05-06-003A: Slag producing delay element for black powder charges:
Into a suitable blender or mixer equipped with plastic stirring blade, place 150 milliliters of 95% ethyl alcohol, or 150 milliliters of denatured alcohol, followed by ***400 grams of standard powdered chromium***, followed by ***50 grams of potassium perchlorate***, followed by ***50 grams of barium chromate***, and then blend the mixture on moderate speed for about 30 minutes at room temperature to form a pasty mass. After 30 minutes, the mixture is ready to be used. To use, it merely needs to be laid out onto a shallow pan and then allowed to dry. Once thoroughly dry, it needs to be pulverized into a powder using a ball mill or equivalent, and then press the powder into any desirable container, pellets, tubes, ect., under high pressure (10,000 psi).
Burn rate: 1.5 seconds per inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% chromium metal, 10% potassium perchlorate, 10% barium chromate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in black powder blasting powders.

05-06-003B: Slag producing delay element for black powder charges (modified):
Into a suitable blender or mixer equipped with plastic stirring blade, place 100 milliliters of 95% ethyl alcohol, or 150 milliliters of denatured alcohol, followed by ***150 grams of standard powdered molybdenum***, followed by ***25 grams of potassium perchlorate***, followed by ***325 grams of barium chromate***, and then blend the mixture on moderate speed for about 30 minutes at room temperature to form a pasty mass. After 30 minutes, the mixture is ready to be used. To use, it merely needs to be laid out onto a shallow pan and then allowed to dry. Once thoroughly dry, it needs to be pulverized into a powder using a ball mill or equivalent, and then press the powder into any desirable container, pellets, tubes, ect., under high pressure (10,000 psi).
Burn rate: 18 seconds per inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% molybdenum, 10% potassium perchlorate, 10% barium chromate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in black powder blasting powders.

05-06-003C: Slag producing delay element for black powder charges (modified 2):
Into a suitable blender or mixer equipped with plastic stirring blade, place 100 milliliters of 95% ethyl alcohol, or 150 milliliters of denatured alcohol, followed by ***133 grams of standard powdered tungsten***, followed by ***47.5 grams of potassium perchlorate***, followed by ***294.5 grams of barium chromate***, followed by ***25 grams of diatomaceous earth***, and then blend the mixture on moderate speed for about 30 minutes at room temperature to form a pasty mass. After 30 minutes, the mixture is ready to be used. To use, it merely needs to be laid out onto a shallow pan and then allowed to dry. Once thoroughly dry, it needs to be pulverized into a powder using a ball mill or equivalent, and then press the powder into any desirable container, pellets, tubes, ect., under high pressure (10,000 psi).
Burn rate: 40 seconds per inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.9% barium chromate, 26.6% tungsten metal, 9.5% potassium perchlorate, 5% diatomaceous earth***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used as a delay element in black powder blasting powders.

05-06-004A: Pyrotechnic delay composition for detonators:

Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of normal diameter size, place ***200 grams of finely divided antimony*** of standard mesh, followed by ***295 grams of finely divided potassium permanganate***, followed by ***5 grams of standard powdered silicon***, and then add in 150 milliliters of acetone, and then tumble the mixture at 50 RPM until the bulk of the acetone evaporates. Once the bulk of the acetone evaporates, place the remaining mass onto a shallow tray, and allow it to thoroughly air-dry. Thereafter, press the mixture into any desirable tube or container under a pressure of 1400 psi. A standard black powder fuse can be used for initiation.

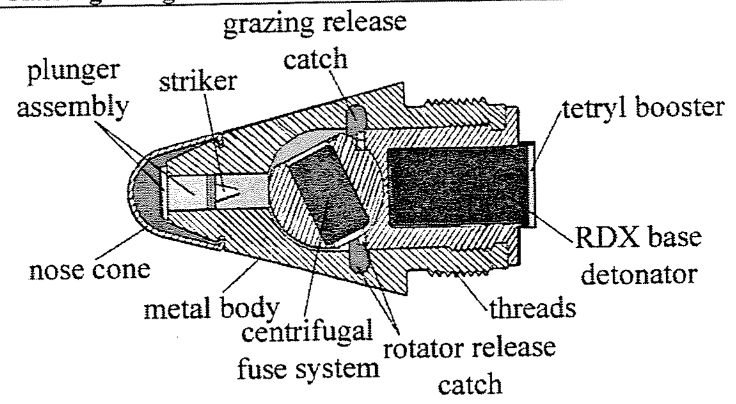
Burn rate: 0.25 seconds at 3 millimeters in diameter by 2.5 millimeters in height
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: May detonate under severe conditions.
Percentage: ***59% potassium permanganate, 40% antimony, 1% silicon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in detonators.

05-06-005A: Pyrotechnic delay composition for pyrotechnic munitions, fuses, and other means:

Into a suitable mixing bowl, blender, ect, utilizing a motorized stirrer, place ***220 grams of lead-II-oxide***, followed by ***195 grams of lead-VI-chromate***, followed by ***80 grams of finely powdered silicon***, and then followed by ***5 grams of linseed oil***. Thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture at moderate speed until the bulk of the solvent has evaporated. Thereafter, place the blended mixture into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture for about 2 hours at 75 RPM. After about 2 hours, the mixture should be ready for pressing. To do so, the mixture needs to be pressed into pellets, tablets, discs, rods, ect., under a pressure of about 5000 psi under the usual means, or it can be extruded into fuse cores under a pressure of about 10,000 psi utilizing the normal techniques.

Burn rate: 26 seconds per foot (of average, actual burn times may vary on pressed dimensions).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44% lead-II-oxide, 39% lead-VI-chromate, 16% silicon, 1% linseed oil***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, and other elements. Is more adapted for use as a delay element in artillery shell fuses.

Classic grazing fire fuze for use in 25 to 75 millimeter projectiles



Details:

This fuze works in a similar manner to other point initiating, point detonating fuses for use in explosive shells. When the projectile is fired, the centrifugal force caused by the rapid acceleration of the projectile forces the centrifugal fuse system to right itself north to south. When this happens, the primer assembly (not text written, but located on the north of the centrifugal fuse system) is exposed to the striker assembly. Upon impact, or upon grazing a hard target, the spring-loaded striker pin is released, and the striker pin slams down upon the primer located on the north side of the centrifugal fuse system. This activity begins the explosive train seen in the usual manner.

05-06-005B: Pyrotechnic delay composition for pyrotechnic munitions, fuses, and other means (with decreased burn rate):

Into a suitable mixing bowl, blender, ect, utilizing a motorized stirrer, place ***440 grams of lead-VI-chromate***, followed by ***50 grams of finely powdered silicon***, and then followed by ***5 grams of finely powdered aluminum***, and then followed by ***5 grams of linseed oil***. Thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture at moderate speed until the bulk of the solvent has evaporated. Thereafter, place the blended mixture into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture for about 2 hours at 75 RPM. After about 2 hours, the mixture should be ready for pressing. To do so, the mixture needs to be pressed into pellets, tablets, discs, rods, ect., under a pressure of about 5000 psi under the usual means, or it can be extruded into fuse cores under a pressure of about 10,000 psi utilizing the normal techniques.

Burn rate: 42 seconds per foot (of average, actual burn times may vary on pressed dimensions).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***88% lead-VI-chromate, 10% silicon, 1% aluminum, 1% linseed oil***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, and other elements.

05-06-006A: Pyrotechnic delay composition for use in blasting caps and detonators:

Into a suitable mixing drum, ball mill, ect., place ***42 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***18 grams of finely powdered aluminum*** of average mesh, and then tumble the mixture at 100 RPM for about 1 to 2 hours at room temperature. Thereafter, add in ***194 grams of finely powdered silicon***, and then followed by ***500 grams of lead tetraoxide (Pb3O4)***, and then continue to blend the mixture for about 1 hour at low RPM. Thereafter, the mixture is ready for use.

Burn rate: 17 milliseconds per small sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.3% lead tetraoxide, 25.7% silicon, 5.5% mischmetal, 2.3% aluminum, 0.20% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-006B: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate):

This operation is identical to the previous, but the aluminum is replaced with copper. Into a suitable mixing drum, ball mill, ect., place ***42 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***18 grams of finely powdered copper*** of average mesh, and then tumble the mixture at 100 RPM for about 1 to 2 hours at room temperature. Thereafter, add in ***194 grams of finely powdered silicon***, and then followed by ***500 grams of lead tetraoxide (Pb3O4)***, and then continue to blend the mixture for about 1 hour at low RPM. Thereafter, the mixture is ready for use.

Burn rate: 61 milliseconds per small sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.3% lead tetraoxide, 25.7% silicon, 5.5% mischmetal, 2.3% copper, 0.20% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-006C: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate):

This operation is identical to the previous, but the copper is replaced with tin. Into a suitable mixing drum, ball mill, ect., place ***42 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum,

16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***18 grams of finely powdered tin*** of average mesh, and then tumble the mixture at 100 RPM for about 1 to 2 hours at room temperature. Thereafter, add in ***194 grams of finely powdered silicon***, and then followed by ***500 grams of lead tetraoxide (Pb3O4),*** and then continue to blend the mixture for about 1 hour at low RPM. Thereafter, the mixture is ready for use.
Burn rate: 158 milliseconds per small sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.3% lead tetraoxide, 25.7% silicon, 5.5% mischmetal, 2.3% tin, 0.20% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-007A: Pyrotechnic delay composition for use in blasting caps and detonators:
Into a suitable mixing drum, blender, ect., equipped with a motorized stirrer in the usual means, place ***35 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***15 grams of finely powdered magnesium*** of average mesh, followed by 200 milliliters of acetone, and then blend the mixture on moderate speed for about 5 to 10 minutes. Thereafter, add in ***90.2 grams of finely powdered silicon***, and then followed by ***59.6 grams of potassium permanganate,*** and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready for use. To use, the pasty mixture simply needs to be dried at room temperature, and the resulting dried mass then pulverized in a ball mill filled with Teflon coated steel shot of the usual diameter. Use caution when tumbling to prevent dust kick-up and possible friction ignition caused by the tumbling Teflon coated steel balls. After the tumbling process, the dried pulverized mixture simply needs to be passed through mesh screens of 200 to 500 mesh to separate out the various grain sizes. The grains can then be pressed under pressure into any desirable blasting cap, detonator, ect.
Burn rate: 140 milliseconds per small grain sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45.1% silicon, 29.8% potassium permanganate, 17.5% mischmetal, 7.5% magnesium, 0.10% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-007B: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate):
This process is identical to the above one, but the permanganate is simply replaced with manganese dioxide. Into a suitable mixing drum, blender, ect., equipped with a motorized stirrer in the usual means, place ***34 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***14.6 grams of finely powdered magnesium*** of average mesh, followed by 200 milliliters of acetone, and then blend the mixture on moderate speed for about 5 to 10 minutes. Thereafter, add in ***87.6 grams of finely powdered silicon***, and then followed by ***63.6 grams of manganese dioxide,*** and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready for use. To use, the pasty mixture simply needs to be dried at room temperature, and the resulting dried mass then pulverized in a ball mill filled with Teflon coated steel shot of the usual diameter. Use caution when tumbling to prevent dust kick-up and possible friction ignition caused by the tumbling Teflon coated steel balls. After the tumbling process, the dried pulverized mixture simply needs to be passed through mesh screens of 200 to 500 mesh to separate out the various grain sizes. The grains can then be pressed under pressure into any desirable blasting cap, detonator, ect.
Burn rate: 570 milliseconds per small grain sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.8% silicon, 31.8% manganese dioxide, 17% mischmetal, 7.3% magnesium, 0.10% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-007C: Pyrotechnic delay composition for use in blasting caps and detonators:
Into a suitable mixing drum, blender, ect., equipped with a motorized stirrer in the usual means, place ***38 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***38 grams of finely powdered magnesium*** of average mesh, followed by 200 milliliters of acetone, and then blend the mixture on moderate speed for about 5 to 10 minutes. Thereafter, add in ***136.5 grams of finely powdered silicon***, followed by ***215 grams of lead dioxide,*** followed by ***72.5 grams lead-VI-chromate,*** and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready for use. To use, the pasty mixture simply needs to be dried at room temperature, and the resulting dried mass then pulverized in a ball mill filled with Teflon coated steel shot of the usual diameter. Use caution when tumbling to prevent dust kick-up and possible friction ignition caused by the tumbling steel balls. After the tumbling process, the dried pulverized mixture simply needs to be passed through mesh screens of 200 to 500 mesh to separate out the various grain sizes. The grains can then be pressed under pressure into any desirable blasting cap, detonator, ect.
Burn rate: 200 milliseconds per 0.30 inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43% lead dioxide, 27.3% silicon, 14.5% lead-VI-chromate, 7.6% mischmetal, 7.6% magnesium***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-007D: Pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate):
Into a suitable mixing drum, blender, ect., equipped with a motorized stirrer in the usual means, place ***22.1 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***22.1 grams of finely powdered magnesium*** of average mesh, followed by 150 milliliters of acetone, and then blend the mixture on moderate speed for about 5 to 10 minutes. Thereafter, add in ***79.4 grams of finely powdered silicon***, followed by ***28.2 grams of lead dioxide,*** followed by ***48.2 grams barium nitrate,*** and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready for use. To use, the pasty mixture simply needs to be dried at room temperature, and the resulting dried mass then pulverized in a ball mill filled with Teflon coated steel shot of the usual diameter. Use caution when tumbling to prevent dust kick-up and possible friction ignition caused by the tumbling steel balls. After the tumbling process, the dried pulverized mixture simply needs to be passed through mesh screens of 200 to 500 mesh to separate out the various grain sizes. The grains can then be pressed under pressure into any desirable blasting cap, detonator, ect.
Burn rate: 350 milliseconds per 0.30 inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.7% silicon, 24.1% barium nitrate, 14.1 lead dioxide, 11% mischmetal, 11% magnesium, 0.10% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-007E: Pyrotechnic delay composition for use in blasting caps and detonators with increased burn rate:
Into a suitable mixing drum, blender, ect., equipped with a motorized stirrer in the usual means, place ***9.2 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron. Thereafter add in ***9.2 grams of finely powdered magnesium*** of average mesh, followed by 150 milliliters of acetone, and then blend the mixture on moderate speed for about 5 to 10 minutes. Thereafter, into a clean empty ball mill, place ***16 grams of finely powdered "Mischmetal"***, which is a commercially available metal alloy containing 49% cerium, 25% lanthanum, 16% neodymium, 4% praseodymium, 2% samarium, 1% terbium, 1% yttrium, and 0.8% iron, followed by ***37.4 grams of finely powdered silicon***, and then tumble the mixture at about 100 RPM for about 15 minutes. Note: this tumbling operation can be preformed before the previous blending mix. After the tumbling operation, throw in the acetone/mischmetal/magnesium mixture, and then continue to tumble the mixture for about 10 minutes at room temperature. Thereafter, add in ***120.5 grams of additional finely powdered silicon***, followed by ***307.5 grams of lead tetraoxide (Pb3O4),*** and then followed by 100 grams of Teflon coated steel shot of 5 millimeters in diameter, and then continue to tumble the mixture until all the acetone evaporates. Note: heat and/or vacuum can be added to speed up the evaporation process. Note: Use caution when tumbling to

prevent dust kick-up and possible friction ignition caused by the tumbling steel balls. Thereafter, the mixture is ready for use. To use, the dry pulverized mixture simply needs to be passed through mesh screens of 200 to 500 mesh to separate out the various grain sizes. The grains can then be pressed under pressure into any desirable blasting cap, detonator, ect.
Burn rate: 170 milliseconds per 0.5 inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.5% lead tetraoxide, 31.5% silicon, 5% mischmetal, 1.8% magnesium, 0.20% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-008A: Pyrotechnic delay composition for use in blasting caps and detonators:
Into a suitable mixing drum, blender, ect., equipped with a motorized stirrer in the usual means, place ***33.5 grams of finely powdered magnesium*** of average mesh, followed by 200 milliliters of acetone, and then add in ***60.2 grams of finely powdered silicon***, and then blend the mixture on moderate speed for about 5 to 10 minutes. Thereafter, add in ***156.2 grams of lead tetraoxide (Pb3O4)***, and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready for use. To use, the pasty mixture simply needs to be dried at room temperature, and the resulting dried mass then pulverized in a ball mill filled with Teflon coated steel shot of the usual diameter. Use caution when tumbling to prevent dust kick-up and possible friction ignition caused by the tumbling steel balls. After the tumbling process, the dried pulverized mixture simply needs to be passed through mesh screens of 200 to 500 mesh to separate out the various grain sizes. The grains can then be pressed under pressure into any desirable blasting cap, detonator, ect.
Burn rate: 86 milliseconds per small grain sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***62.5% lead tetraoxide, 24% silicon, 13.4% magnesium, 0.10% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-009A: Standard pyrotechnic delay composition for use in blasting caps and detonators:
Into a suitable vertical ball mill, place ***160 grams of lead tetraoxide***, and then add in ***40 grams of finely powdered silicon***, and then throw in 50 milliliters of diethyl ether, and then rotate the mixing drum at 150 RPM until all the ether evaporates, and a uniform powder is obtained. Thereafter, the mixture is ready to use. To use, it simply needs to be pressed into the right location of any desirable blasting cap or detonator. This composition is best used before the lead azide charge.
Burn rate: 74 milliseconds per 10.5 millimeter length sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% lead tetraoxide, 20% silicon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-009B: Standard pyrotechnic delay composition for use in blasting caps and detonators (reduced burn rate):
Into a suitable vertical ball mill, place ***186 grams of lead tetraoxide***, and then add in ***14 grams of finely powdered silicon***, and then throw in 50 milliliters of diethyl ether, and then rotate the mixing drum at 150 RPM until all the ether evaporates, and a uniform powder is obtained. Thereafter, the mixture is ready to use. To use, it simply needs to be pressed into the right location of any desirable blasting cap or detonator. This composition is best used before the lead azide charge.
Burn rate: 430 milliseconds per 8-millimeter length sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9

Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***93% lead tetraoxide, 7% silicon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an explosive delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-010A: Standard slow burning pyrotechnic delay composition for use in blasting caps and detonators:
Into a suitable mixing bowl, blender, ect., equipped with the usual style of motorized stirrer, place 150 milliliters of acetone, followed by ***101.5 grams of barium chromate***, followed by ***179.5 grams of lead-VI-chromate***, followed by ***180 grams of lead tetraoxide*** (Pb3O4), followed by ***31 grams of finely powdered silicon***, and then followed by ***8 grams of finely powdered selenium***, and then blend the mixture on moderate speed until the bulk of the acetone evaporates. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a clean ball mill, filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the mixture at 100 RPM for about 30 minutes to form a uniform mixture. Thereafter, the powder is ready for use. To use, the powder simply needs to be pressed into any desirable blasting cap, fuse, detonator, or mold under mild pressure, or the powder can be dead pressed at several thousand pounds per square inch into pellets, discs, rods, ect., depending on the dimensions of the cap, detonator, or fuse.
Burn rate: 5 ½ seconds at 1 inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***36% lead tetraoxide, 35.9% lead-VI-chromate, 20.3% barium chromate, 6.2% silicon, 1.6% selenium***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-011A: Pyrotechnic delay composition for use in blasting caps and detonators:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual size and diameter, place ***225 grams of barium peroxide***, followed by ***75 grams of finely powdered selenium***. Thereafter, add in 150 milliliters of hexane, and then tumble the mixture at 50 RPM for about 30 minutes. Thereafter, place the tumbled mixture onto a shallow pan, and allow it to thoroughly air-dry. Once it has dried, place it back into a clean ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumble the dried mass at 150 RPM for about 30 to 40 minutes. Thereafter, add in 33.3 grams of a low melting alloy, prepared by melting together, ***28.3 grams of lead*** and ***5 grams of tin***, and then pulverizing the cooled alloy thereafter. Then continue to tumble the mixture at 150 RPM for about 30 more minutes. Afterwards, the uniform mixture is ready for use. To use, the mixture can be pressed loosely into any desirable blasting cap or detonator in the usual manner, or pressed into any desirable tube, container, mold, ect., under a pressure of about 8000 psi. The mixture is readily ignited by a black powder fuse or electric squib.
Burn rate: 371 milliseconds.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***67.5% barium peroxide, 22.5% selenium, 8.4% lead, 1.5% tin, 0.1% mixed impurities or equivalent***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-012A: Pyrotechnic delay composition for use in blasting caps and detonators:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***19.2 grams of finely powdered silicon***, followed by ***22 grams of a powdered metal alloy*** containing 70% titanium, and 30% nickel, followed by ***166 grams of finely powdered zinc***, and then followed by ***200 grams of potassium permanganate***. Then add in 150 milliliters of hexane, and then blend the mixture on high speed at room temperature until the bulk of the hexane evaporates. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture for about 1 hour at 150 RPM. Thereafter, the uniform powder is ready for use. To use, it simply needs to be pressed into tablets, pellets, discs, ect., under a pressure of 30000 psi.
Burn rate: 150 at 0.20 inch length.
Scatter: 25+
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.1% potassium permanganate, 40.7% zinc, 5.4% metal alloy, 4.7% silicon, 0.10% balanced material***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-012B: Pyrotechnic delay composition for use in blasting caps and detonators (modified—metal alloy free): Into a suitable mixing bowl, equipped with motorized stirrer, place ***19.2 grams of finely powdered silicon***, followed by ***166 grams of finely powdered zinc***, and then followed by ***200 grams of potassium permanganate***. Then add in 150 milliliters of hexane, and then blend the mixture on high speed at room temperature until the bulk of the hexane evaporates. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture for about 1 hour at 150 RPM. Thereafter, the uniform powder is ready for use. To use, it simply needs to be pressed into tablets, pellets, discs, ect., under a pressure of 30000 psi.
Burn rate: 200 at 0.45 inch length.
Scatter: 15+
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***51.9% potassium permanganate, 43% zinc, 4.9% silicon, 0.2% balanced material***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-012C: Pyrotechnic delay composition for use in blasting caps and detonators (permanganate free): Into a suitable mixing bowl, equipped with motorized stirrer, place ***100 grams of finely powdered metal alloy*** containing 70% zirconium and 30% nickel followed by ***100 grams of lead tetraoxide***. Then add in 150 milliliters of hexane, and then blend the mixture on high speed at room temperature until the bulk of the hexane evaporates. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture for about 1 hour at 150 RPM. Thereafter, the uniform powder is ready for use. To use, it simply needs to be pressed into tablets, pellets, discs, ect., under a pressure of 30000 psi.
Burn rate: 190 at 0.55 inch length.
Scatter: 15+
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% metal alloy, 50% lead tetraoxide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-013A: Pyrotechnic delay composition for use in blasting caps and detonators (nitrocellulose reinforced): Into a suitable mixing bowl, equipped with motorized stirrer, place ***180 grams of finely divided silicon,*** followed by ***204 grams of finely divided copper,*** followed by ***216 grams of lead dioxide***, and then followed by ***5 grams of nitrocellulose***. Then add in 150 milliliters of hexane, and then blend the mixture on high speed at room temperature until the bulk of the hexane evaporates. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture for about 1 hour at 150 RPM. Thereafter, the uniform powder is ready for use. To use, it simply needs to be pressed into tablets, pellets, discs, ect., under a pressure of 30000 psi. Can be ignited using any standard means.
Burn rate: Test fires at 90+ milliseconds.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8

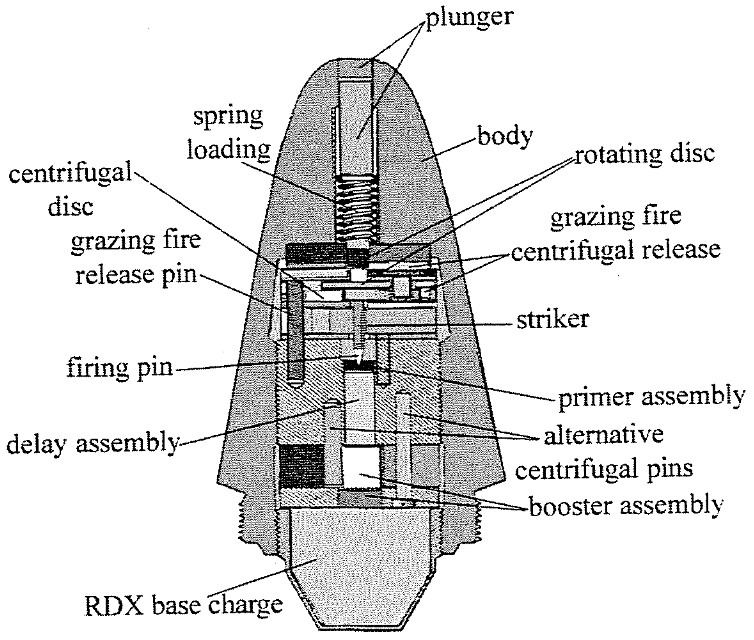
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35.7% lead dioxide, 33.7% copper metal, 29.7% silicon, 0.82% nitrocellulose, 0.08% balanced ingredients***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element in fuses, detonators, time fuse, blasting caps, ect.

05-06-014A: Pyrotechnic delay composition for use grenade fuses (activated by primer): Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place 150 milliliters of diethyl ether or acetone, and then add in ***156 grams of a commercially available aluminum/magnesium alloy***, containing 50% aluminum and 50% magnesium. The alloy should be in finely ground state. Thereafter, add in ***141 grams of barium nitrate***, followed by ***3 grams of caster oil***, and then blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow the mass to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 200 grams or more of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 300 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into pellets, discs, tablets, or rods under a pressure of about 15000 psi in the usual manner. The mixture can be ignited by a standard percussion primer.
Burn rate: Above moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on combustion).
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52% aluminum/magnesium alloy, 47% barium nitrate, 1% castor oil***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in grenade fuses.

05-06-014B: Pyrotechnic delay composition for use grenade fuses (activated by primer), modified: Into a suitable ball mill, containing Teflon coated steel shot of the usual diameter and weight, place ***52 grams of finely divided copper metal***, followed by ***52 grams of finely powdered silicon***, followed by ***52 grams of finely divided zinc*** of average mesh, and then followed by ***3 grams of castor oil***. Thereafter, tumble the mixture of metals for about 30 minutes to coat them with the oil. After 30 minutes, throw in ***141 grams of barium nitrate***, and then continue to tumble the mixture at 150 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into pellets, discs, tablets, or rods under a pressure of about 15000 psi in the usual manner. The mixture is readily ignited by a standard percussion primer.
Burn rate: Above moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on combustion).
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47% barium nitrate, 17.3% copper metal, 17.3% silicon, 17.3% zinc, 1% castor oil, 0.10% balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in grenade fuses.

05-06-015A: Pyrotechnic delay composition for use in fuses for various military devices: Into a suitable ball mill, containing Teflon coated steel shot of the usual diameter and weight, place ***100 grams of tin dioxide***, followed by ***65 grams of a finely powdered zirconium/nickel alloy*** containing 70% zirconium and 30% nickel, followed by ***75 grams of finely divided antimony***, followed by ***25 grams of potassium perchlorate,*** and then followed by ***235 grams of bismuth trioxide.*** Thereafter, tumble the mixture for about 30 minutes to form a uniform mixture. After 30 minutes the mixture is ready for use. To use, the mixture needs to be pressed into pellets, discs, tablets, or rods under a pressure of about 15,000 psi in the usual manner. The mixture is ignited by any standard means, but ignition utilizing electric devices may not work satisfactorily.
Burn rate: 11 millimeters per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 (based on combustion, yields a hot slag).
Ease of ignition (1 to 10): 6 (based on black powder ignition).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47% bismuth trioxide, 20% tin dioxide, 15% antimony, 13% zirconium/nickel alloy, 5% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Used in time fuses, and other devices where a delay between primary actions is required.

Standard impact fuze for projectiles	Details:
 plunger spring loading body rotating disc centrifugal disc grazing fire release pin grazing fire centrifugal release striker firing pin primer assembly delay assembly alternative centrifugal pins booster assembly RDX base charge	Standard impact fuze works in a typical manner, where as a spring loaded striker is set in place using a spring loading, which is released upon impact of the fuze on a hard target. Grazing fire centrifugal release latches ensure the fuze will detonate even if it grazes a hard target.

05-06-015B: Pyrotechnic delay composition for use in fuses for various military devices (decreased burn rate):
This nearly identical procedure is a modification to decrease the burn rate of 05-06-015A. Into a suitable ball mill, containing Teflon coated steel shot of the usual diameter and weight, place ***100 grams of tin dioxide***, followed by ***50 grams of a finely powdered zirconium/nickel alloy*** containing 70% zirconium and 30% nickel, followed by ***50 grams of finely divided antimony***, followed by ***25 grams of potassium perchlorate***, and then followed by ***275 grams of bismuth trioxide.*** Thereafter, tumble the mixture for about 30 minutes to for a uniform mixture. After 30 minutes the mixture is ready for use. To use, the mixture needs to be pressed into pellets, discs, tablets, or rods under a pressure of about 15,000 psi in the usual manner. The mixture is ignited by any standard means, but ignition utilizing electric devices may not work satisfactorily.
Burn rate: 7 millimeters per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 (based on combustion, yields a hot slag).
Ease of ignition (1 to 10): 6 (based on black powder ignition).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55% bismuth trioxide, 20% tin dioxide, 10% antimony, 10% zirconium/nickel alloy, 5% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in time fuses, and other devices where a delay between primary actions is required.

05-06-015C: Pyrotechnic delay composition for use in fuses for various military devices (decreased burn rate):
Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place ***250 grams of tin dioxide***, followed ***155 grams of titanium dioxide***, followed by ***50 grams of finely divided antimony***, followed by ***20 grams of finely powdered boron***, followed by ***25 grams of potassium perchlorate***, and then add in 150 milliliters of acetone, and then blend the mixture until the bulk of the acetone evaporates. Thereafter, place the damp mixture onto a shallow pan or tray, and then allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of 5 milliliters in diameter, and then tumble the mixture at 200 RPM or more, for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use. To use, the powder simply needs to be pressed into pellets, tablets, rods, ect., in the usual manner. Can be ignited using any suitable means.
Burn rate: 2 to 3 millimeters per second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 (based on combustion, yields a hot slag).
Ease of ignition (1 to 10): 6 (based on black powder ignition).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% tin dioxide, 31% titanium dioxide, 10% antimony, 5% potassium perchlorate, 4% boron***

Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in time fuses, and other devices where a delay between primary actions is required.

05-06-016A: Moldable pyrotechnic delay composition for use in fuses:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place ***241 grams Dapon 35 diallyl phthalate prepolymer*** (sold by the FMC Corp.), followed by ***8.6 grams of diallyl phthalate monomer***, followed by ***650 milligrams of zulu blue dye*** (sold by the Harshaw Chemical Co.), followed by ***5 grams of calcium stearate***, followed by ***5 grams of butylperbenzoate***, and then add in 1800 milliliters of acetone, and then blend the mixture until the bulk of the acetone evaporates, and/or a pasty mass remains. Note: vacuum can be used to remove the acetone if desired, but requires the proper equipment in the normal fashion. Thereafter, place the paste into a heated ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter, and ball mill the mass at 75 Celsius at 200 RPM until a fine powder is obtained. Now, into a clean ball mill filled with 200 grams of Teflon coated steel shot of the usual diameter, followed by ***62 grams of finely divided boron powder,*** followed by ***62 grams of calcium silicide,*** followed by ***384 grams of potassium perchlorate,*** and then followed by ***95 grams of red lead oxide,*** and then tumble the mixture at 300 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use. To use, the powder simply needs to be pressed into pellets, tablets, rods, ect., at 10,000 psi at 180 Celsius. Can be ignited using any suitable means.
Burn rate: Slow. Burns smoothly.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 (based on combustion, yields a hot slag).
Ease of ignition (1 to 10): 6 (based on black powder ignition).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44% potassium perchlorate, 28% Dapon prepolymer, 11% red lead oxide, 7% calcium silicide, 7% boron, 1.36% moisture, 1% diallyl phthalate monomer, 0.57% calcium stearate, 0.57% butylperbenzoate, 0.07% zulu blue dye***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in multiple devices where a smooth burning delay element is required.

05-06-017A: Pyrotechnic delay composition for use in fuses:
Into a suitable ball mill, place 10 milliliters of ethyl acetate, followed by 5 grams of nitrocellulose of average nitrogen content. Thereafter, add in ***60 grams of finely divided selenium metal***, and then tumble the mixture at 100 RPM for about 30 minutes. Thereafter, place this tumbled mixture onto a shallow pan, and allow it to thoroughly air dir. Now, into a separate mixing bowl, equipped with motorized stirrer, place 200 milliliters of 95% ethyl alcohol, and then add in the dried selenium material. Thereafter, add in ***340 grams of barium peroxide***, and then blend the mixture at moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desired fuse body, container, mold, fuse cord, ect., under high pressure, and then cure the devices in a oven at moderate temperature.
Burn rate: Burns rather slow on average—depends on pressure of molding.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+ (based on combustion, yields a hot slag).
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***84.9% barium peroxide, 14.9% selenium metal, 0.2% nitrocellulose***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in multiple devices where a smooth burning delay/fuse element is required.

05-06-018A: Pyrotechnic delay composition for multiple uses:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual manner, place ***50 grams of barium nitrate***, followed by ***225 grams of silicon powder***, and then followed by ***225 grams of sodium azide***. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desired fuse body, container, mold, fuse cord, ect., under high pressure in the usual manner. Should be ignited using a high temperature ignition composition.
Burn rate: Slow—with difficulty.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% sodium azide, 45% silicon powder, 10% barium nitrate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used in time fuse, grenades, and shells, and for other uses.

05-06-018B: Pyrotechnic delay composition for multiple uses:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual manner, place ***50 grams of potassium perchlorate***, followed by ***225 grams of potassium azide***, and then followed by ***225 grams of magnesium powder***. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desired fuse body, container, mold, fuse cord, ect., under high pressure in the usual manner. Should be ignited using a high temperature ignition composition.
Burn rate: Slow—with difficulty.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% potassium azide, 45% magnesium powder, 10% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in time fuse, grenades, and shells, and for other uses.

05-06-019A: Pyrotechnic delay composition for multiple uses:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual manner, place ***490 grams of silver-I-chromate***, and then followed by ***10 grams of red phosphorus***. Thereafter, spray in 75 milliliters of hexane, and then tumble the mixture at 150 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into pellets, tablets, rods, ect., under high pressure or pressed into time fuses of any desired diameter and length in the usual manner. Can be ignited using any desired means.
Burn rate: 10 seconds per inch at .22-inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***98% silver-I-chromate, 2% red phosphorus***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in time fuse and any desired munitions where an applicable delay is needed.

05-06-019B: Pyrotechnic delay composition for multiple uses:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual manner, place ***450 grams of calcium chromate***, and then followed by ***50 grams of red phosphorus***. Thereafter, spray in 125 milliliters of hexane, and then tumble the mixture at 175 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into pellets, tablets, rods, ect., under high pressure or pressed into time fuses of any desired diameter and length in the usual manner. Can be ignited using any desired means.
Burn rate: 17 seconds per inch at .22-inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***90% calcium chromate, 10% red phosphorus***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in time fuse and any desired munitions where an applicable delay is needed.

05-06-020A: Pyrotechnic delay composition for multiple uses:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual manner, place ***450 grams of red iron oxide***, followed by ***75 grams of red phosphorus,*** followed by ***15 grams of copper-II-oxide***, followed by ***50 grams of sodium hypophosphite***, and then followed by ***75 grams of sodium chlorate***. Thereafter, spray in 125 milliliters of hexane or ether, and then tumble the mixture at 175 RPM for about 1 hour. Thereafter, add in ***50 grams of sodium chloride***, and then continue to tumble the mixture at 200 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into pellets, tablets, rods, ect., under high pressure or pressed into time fuses of any desired diameter and length in the usual manner. Can be ignited using any desired means.

Burn rate: Exact time may vary.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***62.93% red iron oxide, 10.48% red phosphorus, 10.48% sodium chlorate, 6.99% sodium hypophosphite, 6.99% sodium chloride, 2.09% copper-II-oxide, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in time fuse and any desired munitions where an applicable delay is needed.

05-06-021A: Pyrotechnic delay composition for multiple uses:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual manner, place ***450 grams of barium peroxide***, followed by ***100 grams of red phosphorus,*** followed by ***300 grams of strontium chromate***, followed by ***25 grams of silver-I-oxide***, and then followed by ***90 grams of finely powdered food starch***. Thereafter, spray in 150 milliliters of hexane or ether, and then tumble the mixture at 275 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into pellets, tablets, rods, ect., under high pressure or pressed into time fuses of any desired diameter and length in the usual manner. Can be ignited using any desired means.
Burn rate: 15 seconds per inch at .22-inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.63% barium peroxide, 31.08% strontium chromate, 10.36% red phosphorus, 9.32% food starch, 2.59% silver-I-oxide, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in time fuse and any desired munitions where an applicable delay is needed.

05-06-022A: Gasless pyrotechnic delay composition for multiple uses:

Into a suitable mill, filled with Teflon coated steel shot of the usual weight, place ***50 grams of zirconium powder***, followed by ***50 grams of flours of sulfur***. Thereafter, tumble the mixture at 200 RPM for about 2 hours. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 250 milliliters of 95% ethyl alcohol, and then followed by ***900 grams of barium chromate***. Thereafter, blend the mixture for about 45 minutes at moderate speed. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure, and then cure in an oven at low temperature. The mixture can be easily ignited using any desired means.
Burn rate: 11 seconds per inch at .22 inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4 ¾
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***90% barium chromate, 5% zirconium powder, 5% sulfur***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in explosive munitions where a gasless delay element is required.

05-06-022B: Gasless pyrotechnic delay composition for multiple uses:

Into a suitable mill, filled with Teflon coated steel shot of the usual weight, place ***80 grams of finely divided manganese***, followed by ***20 grams of flours of sulfur***. Thereafter, tumble the mixture at 150 RPM for about 2 hours. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 175 milliliters of 95% ethyl alcohol, and then followed by ***400 grams of strontium chromate***. Thereafter, blend the mixture for about 45 minutes at moderate speed. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure, and then cure in an oven at low temperature. The mixture can be easily ignited using any desired means.
Burn rate: 13 seconds per inch at .22-inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4 ½

Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: *80% strontium chromate, 16% manganese, 4% sulfur*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in explosive munitions where a gasless delay element is required.

05-06-022C: Gasless pyrotechnic delay composition for multiple uses:

Into a suitable mill, filled with Teflon coated steel shot of the usual weight, place *120 grams of finely divided manganese*, followed by *10 grams of red phosphorus*. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 190 milliliters of 95% ethyl alcohol, and then followed by *370 grams of barium chromate*. Thereafter, blend the mixture for about 45 minutes at moderate speed. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure, and then cure in an oven at low temperature. The mixture can be easily ignited using any desired means.
Burn rate: 17 seconds per inch at .22-inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: *74% barium chromate, 24% manganese metal, 2% red phosphorus*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in explosive munitions where a gasless delay element is required.

05-06-023A: Gasless pyrotechnic delay composition for multiple uses:

Into a suitable mill, filled with Teflon coated steel shot of the usual weight, place *275 grams of finely divided manganese*, followed by *50 grams of red phosphorus*, and then followed by *50 grams of flours of sulfur*. Thereafter, tumble the mixture at 150 RPM for about 2 hours. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 290 milliliters of 95% ethyl alcohol, and then followed by *400 grams of black copper oxide*, and then followed by *225 grams red iron oxide*. Thereafter, blend the mixture for about 45 minutes at moderate speed. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure, and then cure in an oven at low temperature. The mixture can be easily ignited using any desired means.
Burn rate: 11 seconds per inch at .22-inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: *40% copper oxide, 27.5% manganese, 22.5% red iron oxide, 5% sulfur, 5% red phosphorus*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in explosive munitions where a gasless delay element is required.

05-06-023B: Gasless pyrotechnic delay composition for multiple uses:

Into a suitable mill, filled with Teflon coated steel shot of the usual weight, place *125 grams of iron powder of average mesh*, followed by *125 grams of red phosphorus*, followed by *125 grams of chromium metal powder*, and then followed by *75 grams of flours of sulfur*. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of 95% ethyl alcohol, and then followed by *250 grams of silver-I-oxide*, and then followed by *300 grams barium peroxide*. Thereafter, blend the mixture for about 45 minutes at moderate speed. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure, and then cure in an oven at low temperature. The mixture can be easily ignited using any desired means.
Burn rate: 6 seconds per inch at .22-inch diameter.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.

Percentage: *30% barium peroxide, 25% silver-I-oxide, 12.5% iron powder, 12.5% red phosphorus, 12.5% chromium metal powder, 7.5% sulfur,*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in explosive munitions where a gasless delay element is required.

05-06-024A: Gasless pyrotechnic delay composition for multiple uses:

Into a suitable mill, filled with Teflon coated steel shot of the usual weight, place *40 grams of finely divided graphite powder*, followed by *200 grams of potassium nitrate*, followed by *870 grams of barium peroxide*, and then followed by *60 grams of finely divided silicon*. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *74.35% barium peroxide, 17.09% potassium nitrate, 5.12% silicon, 3.41% graphite powder, 0.03% mixed balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in explosive munitions where a gasless delay element is required.

05-06-024B: Gasless pyrotechnic delay composition for multiple uses:

Into a suitable mill, filled with Teflon coated steel shot of the usual weight, place *28 grams of finely divided graphite powder*, followed by *56 grams of potassium nitrate*, followed by *795 grams of barium peroxide*, followed by *5 grams of aluminum stearate*, followed by *60 grams of nitrocellulose*, and then followed by *56 grams of finely divided silicon*. Thereafter, tumble the mixture at 150 RPM for about 2 hours. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *79.5% barium peroxide, 6% nitrocellulose, 5.6% potassium nitrate, 5.6% silicon, 2.8% graphite, 0.5% aluminum staerate*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in explosive munitions where a gasless delay element is required.

05-06-025A: Pyrotechnic delay composition for use in multi stage rockets:

Into a suitable ball mill, or vertical mixer place *50 grams of barium chromate*, followed by *50 grams of potassium perchlorate*, and then followed by *400 grams of finely ground chromium metal*. Thereafter, tumble or rotate the mixture at 250 RPM for about 2 hours. Note: during the tumbling or rotating process, spray into the mixture, in small portions at a time, 75 milliliters of hexane. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner, and then cured in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: 1.5 seconds per inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *80% chromium metal, 10% barium chromate, 10% potassium perchlorate*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element between rocket compositions in multi-stage rockets/boosters.

05-06-025B: Pyrotechnic delay composition for use in multi stage rockets:

Into a suitable ball mill, or vertical mixer place *125 grams of barium chromate*, followed by *125 grams of potassium perchlorate*, and then followed by *250 grams of finely ground chromium metal*. Thereafter, tumble or rotate the mixture at 250 RPM for about 2

hours. Note: during the tumbling or rotating process, spray into the mixture, in small portions at a time, 75 milliliters of hexane. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner, and then cured in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: 7 seconds per inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% chromium metal, 25% barium chromate, 25% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element between rocket compositions in multi-stage rockets/boosters.

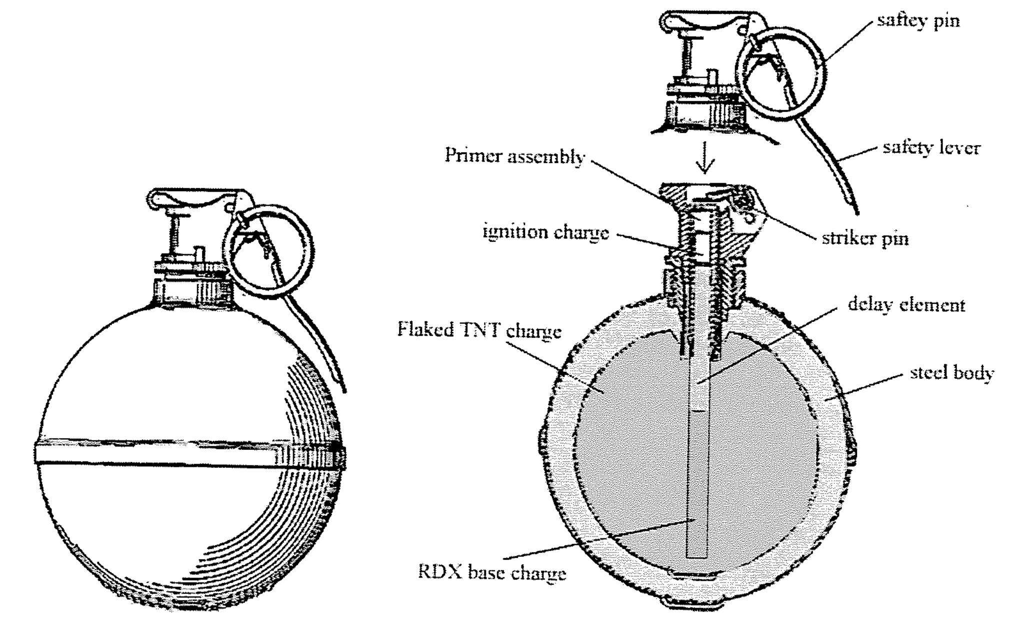
05-06-025C: Pyrotechnic delay composition for use in multi stage rockets:
Into a suitable ball mill, or vertical mixer place ***261.25 grams of barium chromate***, followed by ***47.5 grams of potassium perchlorate,*** and then followed by ***25 grams of diatomaceous earth***. Thereafter, tumble or rotate the mixture at 250 RPM for about 2 hours. Note: during the tumbling or rotating process, spray into the mixture, in small portions at a time, 75 milliliters of hexane. Thereafter, add in ***166.25 grams of molybdenum powder***. Thereafter, continue to tumble the mixture at 400 RPM for about 1 hour at room temperature. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner, and then cured in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: 6 seconds per inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.25% barium chromate, 33.25% molybdenum powder, 9.5% potassium perchlorate, 5% diatomaceous earth***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element between rocket compositions in multi-stage rockets/boosters.

05-06-025D: Pyrotechnic delay composition for use in multi stage rockets:
Into a suitable ball mill, or vertical mixer place ***180 grams of barium chromate***, followed by ***22.5 grams of potassium perchlorate,*** and then followed by ***50 grams of calcined diatomaceous earth***. Thereafter, tumble or rotate the mixture at 250 RPM for about 2 hours. Note: during the tumbling or rotating process, spray into the mixture, in small portions at a time, 75 milliliters of ether. Thereafter, add in ***247.5 grams of finely ground tungsten***. Thereafter, continue to tumble the mixture at 400 RPM for about 1 hour at room temperature. Thereafter, the mixtures ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner, and then cured in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: 10 seconds per inch.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.5% finely ground tungsten, 36% barium chromate, 10% calcined diatomaceous earth, 4.5% potassium perchlorate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element between rocket compositions in multi-stage rockets/boosters.

05-06-026A: Pyrotechnic delay composition for various operations:
Into a suitable ball mill, or vertical mixer place ***15 grams of calcium fluoride***, followed by ***15 grams of diatomaceous earth,*** followed by ***50 grams of potassium perchlorate***, followed by ***300 grams of barium chromate***, and then followed by ***120 grams of powdered metallic tungsten of 4 microns***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture should be placed into a suitable heat resistant bowl, and then dried in an oven at 90 Celsius for eight hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: Very slow—40+ seconds per inch on average.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 4
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% barium chromate, 24% tungsten powder, 10% potassium perchlorate, 3% calcium fluoride, 3% diatomaceous earth***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element for any desired means.

Standard fragmenting grenade



05-06-027A: Pyrotechnic delay composition for various operations:
Into a suitable ball mill, or vertical mixer place ***7.5 grams of zinc stearate***, followed by ***25 grams of diatomaceous earth,*** followed by ***50 grams of potassium perchlorate***, followed by ***242.5 grams of barium chromate***, and then followed by ***175 grams of powdered metallic tungsten of 4 microns***. Thereafter, tumble or rotate the mixture at 150 RPM for about 2 hours. Thereafter, the mixture should be placed into a suitable heat resistant bowl, and then dried in an oven at 90 Celsius for eight hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect, under high pressure in the usual manner. The mixture can be easily ignited using any desired means.
Burn rate: 10 to 12 seconds per inch on average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48.5% barium chromate, 35% tungsten powder, 10% potassium perchlorate, 5% diatomaceous earth, 1.5% zinc stearate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element for any desired means.

05-06-028A: Pyrotechnic delay composition for use at high altitudes for initiating flares, smoke, and rocket compositions:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***365 grams of powdered zirconium metal***, and then add in 150 milliliters of ether. Thereafter, quickly blend the mixture for about 5 minutes. Thereafter, add in ***25 grams of nitrocellulose***, followed by 15 milliliters of 95% ethyl alcohol, followed by 15 milliliters of acetone, followed by ***100 grams of powdered sulfur***, and then followed by ***25 grams of potassium perchlorate***. Thereafter, blend the mixture on high speed for about 1 hour. Note: keep the mixing bowl covered during the blending process to prevent excess solvent evaporation. After 1 hour, the mixture is ready to be used. To use, the mixture should be placed into a vacuum apparatus, and vacuum applied to remove the solvents. Once a dry mass is obtained, the mixture needs to ball milled for 20 to 30 minuets to form a uniform powder. Thereafter, the powder should be pressed into tablets, pellets, ect., under high pressure in the usual manner.

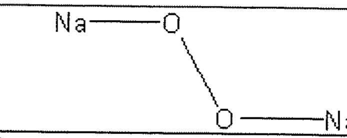
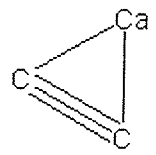
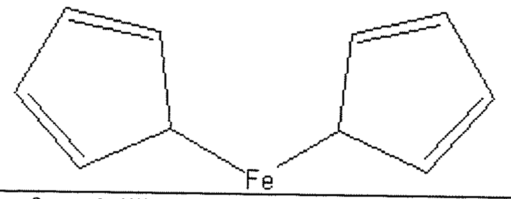
Burn rate: 10 to 12 seconds per inch on average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *70.87% zirconium metal, 19.41% sulfur, 4.85% nitrocellulose, 4.85% potassium perchlorate, 0.02% residual balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as a delay element for any desired means for use at high altitudes.

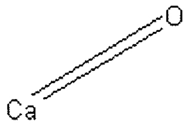
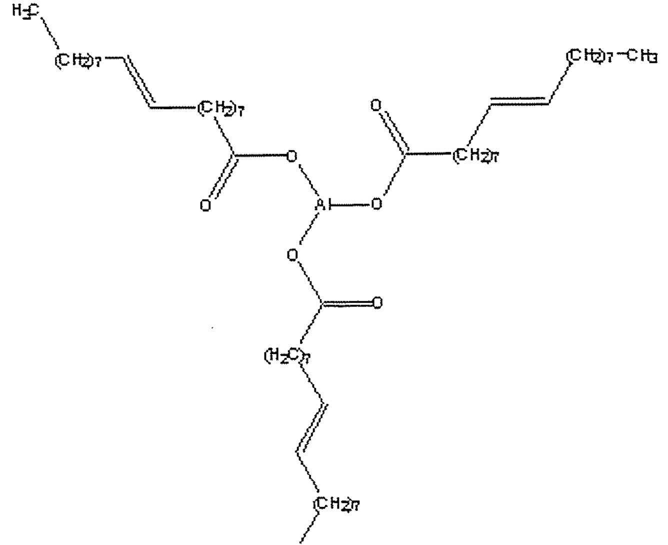
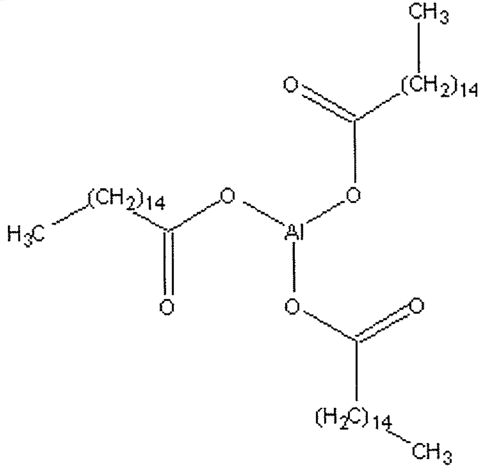
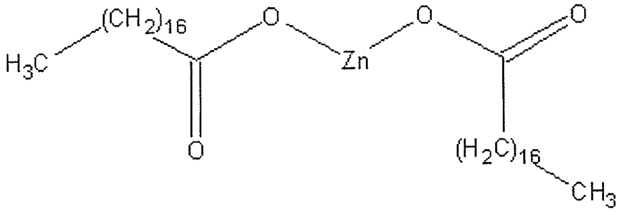
Section 7: Incendiary Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun	**70. Calcium Hydride (see Ammonium Nitrate Gun**

Propellants)	**Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)	**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)	**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)	**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)	**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)	**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)	**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)	**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)	**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)	**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)	**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)	**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)	**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)	**129. Bismuth Subnitrate (see Smoke Generating Compositions)**
130. Calcium Iodate (see Smoke Generating Compositions)	**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)	**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)	**135. Potassium Ferriccyanide (see Priming/Igniter Compositions)**
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)	**137. Bismuth Trioxide (see Priming/Igniter Compositions)**
138. Titanium powder (see Priming/Igniter Compositions)	**139. Tungsten powder (see Priming/Igniter Compositions)**
140. Lead Powder (see Priming/Igniter Compositions)	**141. Lead-II-Oxide (red lead; litharge) (see Priming/Igniter Compositions)**
142. Selenium powder (see Priming/Igniter Compositions)	**143. Sodium Bicarbonate (see Priming/Igniter Compositions)**
144. Iron powder (see Priming/Igniter Compositions)	**145. Silicon Dioxide (see Priming/Igniter Compositions)**
146. Lead Thiocyanate (see Priming/Igniter Compositions)	**147. Para-Nitrotoluene (see Priming/Igniter Compositions)**

148. Silver powder (see Priming/Igniter Compositions)	**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)	**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)	**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)	**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)	**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)	**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate (see Illumination/Flare and Signaling Compositions)	**161. Iodoform (see Illumination/Flare and Signaling Compositions)**
162. Lithium Nitrate (see Illumination/Flare and Signaling Compositions)	**163. Manganese Oxide (see Illumination/Flare and Signaling Compositions)**
164. Sodium Carbonate (see Illumination/Flare and Signaling Compositions)	**165. Molybdenum powder (see Illumination/Flare and Signaling Compositions)**
166. Sodium Oxalate (see Illumination/Flare and Signaling Compositions)	**167. Oxalic Acid (see Illumination/Flare and Signaling Compositions)**
168. Stearic acid (see Illumination/Flare and Signaling Compositions)	**169. Thorium Nitrate (see Illumination/Flare and Signaling Compositions)**
170. Cerium Nitrate (see Illumination/Flare and Signaling Compositions)	**171. Rubidium Nitrate (see Illumination/Flare and Signaling Compositions)**
172. Calcium metal (see Illumination/Flare and Signaling Compositions)	**173. Mercury-II-Chloride (see Illumination/Flare and Signaling Compositions)**
174. Zirconium Carbonate (see Illumination/Flare and Signaling Compositions)	**175. Barium Chloride (see Illumination/Flare and Signaling Compositions)**
176. Antimony powder (see Pyrotechnic Delay Compositions)	**177. Chromium metal (see Pyrotechnic Delay Compositions)**
178. Zinc powder (see Pyrotechnic Delay Compositions)	**179. Tin Dioxide (see Pyrotechnic Delay Compositions)**
180. Silver-I-Chromate (see Pyrotechnic Delay Compositions)	**181. Calcium Chromate (see Pyrotechnic Delay Compositions)**
182. Strontium Chromate (see Pyrotechnic Delay Compositions)	**183. Silver-I-Oxide (see Pyrotechnic Delay Compositions)**
184. Calcium Fluoride (see Pyrotechnic Delay Compositions)	**185. Paraffin**
	$CnH_{2n}{}^{+}{}_{2}$
	Forms a colorless to white solid with a melting point of 50 to 57 Celsius. The hydrocarbon wax is flammable and burns with a luminous flame. The greasy solid is insoluble in water and alcohol, but soluble in chloroform, benzene, and ether
186. Sodium Peroxide	**187. Metallic Lithium**
	
Forms a yellowish white crystalline powder, granules, or solid. The solid decomposes in water forming sodium hydroxide and hydrogen peroxide. The solid reacts with acids forming hydrogen peroxide. Sodium peroxide is a strong oxidizing agent. It can be made by gently heating metallic sodium in a stream of oxygen.	Forms a beautiful silvery-white metal with a silvery luster. The solid tarnishes rapidly when exposed to air. The metal has a melting point of 180 Celsius. Metallic lithium is less reactive then metallic sodium, but it is still highly reactive and reacts violently with acids and water. Users should wear gloves when handling.
188. Calcium Carbide	**189. Ferrocene**
	
Forms a grayish-black powder, or lumps. The solid decomposes with water forming acetylene gas. Calcium carbide is a very common chemical readily available	Ferrocene forms brilliant orange needles with a melting point of 174 Celsius. The solid begins to volatize when heated above 100 Celsius. Ferrocene has the odor of camphor. The crystals

commercially.	are insoluble in water, but soluble in alcohol, ether, and benzene
190. Lime (calcium oxide)	**191. Aluminum Oleate**
	 H3C (CH2)7 (CH2)7–CH3 (CH2)7 O O (CH2)7 O Al O O O O (H2C)7 (CH2)7 H3C
Lime is predominantly calcium oxide, and exists in many colors and variations. It is usually a white to light grayish powder, lumps, or blocks. Limestone reacts vigorously with acids, and is very slightly soluble in water and insoluble in all solvents. Lime is a major ingredient in cement.	Forms a sloppy yellowish viscous mass, which is insoluble in water, but soluble in alcohol, benzene, and ether.
192. Aluminum Palmitate	**193. Zinc Stearate**
 CH3 O (CH2)14 (CH2)14 O O H3C Al O O O (H2C)14 CH3	 (CH2)16 O O O H3C Zn O O (H2C)16 CH3
Forms a white to yellowish mass or crystals. The mass is insoluble in water and the usual solvents, but freshly prepared solid will dissolve in petroleum ether.	Forms a uniform bulky fluffy powder with a melting point of 120 Celsius. The solid is insoluble in water, alcohol, and ether. The dry solid repels water.

- Incendiary Compositions in this section -

1. 05-07-001A: Slow burning safety incendiary composition: *60.4% titanium, 20.1% polytetrafluoroethylene, 14.3% boron, 5% paraffin, 0.20% residue*	**2. 05-07-001B: Slow burning safety incendiary composition (modified):** *60.6% titanium, 20% polytetrafluoroethylene, 14.2% boron, 4% paraffin, 1% lecithin, 0.20% residue*
3. 05-07-002A: Low slag slow burning safety incendiary composition: *50.9% titanium fuel, 22.6% Teflon oxidizer, 11.9% boron fuel promoter, 8.4% copolymer, 4.7% dioctyl adipate plasticizer, 1.1% araldite wetting agent, 0.140% fomrez C-2 curing catalyst*	**4. 05-07-003A: "THERMATE-TH3" standard military incendiary composition:** *51.5% iron oxide, 29% barium nitrate, 17.1% aluminum, 2% sulfur, 0.30% epoxy binder, 0.10% residue*
5. 05-07-004A: Improved penetration incendiary composition: *66.6% potassium nitrate, 14.9% titanium, 8.6% aluminum, 7.7% silicon, 1.9% epoxy binder, 0.3% impurities*	**6. 05-07-005A: Metal cutting incendiary composition:** *46.5% calcium sulfate, 46.5% aluminum, 5% Teflon, 2% sulfur*
7. 05-07-006A: "Floatable" incendiary composition with multiple uses: *56.8% magnesium, 16.1% elastomer resin, 16.1% glass micro spheres (flotation aid), 8% potassium perchlorate, 2.6% stannous octoate polymerization catalyst, 0.40% residue*	**8. 06-07-007A: Metal cutting incendiary composition used to penetrate steel drums and shipping containers:** *32% fluoroalkyl phosphate resin, 28% magnesium, 16% potassium perchlorate, 12% iron-III-oxide, 12% silicon*
9. 05-07-008A: Metal cutting incendiary composition: *55% copper oxide, 20% aluminum, 20% sodium chlorate, 4.6% silicon carbide, 0.40% ferric chloride*	**10. 05-07-009A: "Thermite" incendiary composition:** *75% iron oxide, 25% aluminum*
11. 05-07-010A: Modified "Thermite" incendiary composition with easier ignition properties: *68.5% iron oxide, 29.2% aluminum, 2.2% potassium perchlorate, 0.10% residue*	**12. 05-07-011A: Incendiary composition for breeching lead and other low melting materials:** *44.5% sodium peroxide, 33% cylinder oil, 22.4% hexamine, 0.10% residue*
13. 05-07-012B: Incendiary composition for breeching lead and other low melting materials (modified): *50% sodium peroxide, 25% paraffin wax, 25% hexamine*	**14. 05-07-013A: Incendiary composition with high penetrating power utilizing highly corrosive lithium nitride:** *40% pulverized steel shavings, 30% barium nitrate, 15% aluminum, 15% lithium nitride*
15. 05-07-014A: Slow burning safety incendiary composition (modified): *69% titanium, 16.1% boron, 9% polytetrafluoroethylene, 5.6% chlorinated polyethylene, 0.3% residue*	**16. 05-07-015A: Slurry incendiary composition for generating heat for multiple purposes:** *75% fluorochlorocarbon oil, 22% aluminum, 3% metallic lithium*
17. 05-07-015B: Slurry incendiary composition for incendiary purposes (modified): *46.9% fluorochlorocarbon oil, 21.3% sodium chlorate, 13.7% aluminum, 7.8% naphthalene, 5.2% toluene, 2.6% rubber, 2.1% metallic lithium, 0.40% mixed residues*	**18. 05-07-015C: Slurry incendiary composition for incendiary purposes (modified 2):** *44.1% fluorochlorocarbon oil, 17.5% manganese dioxide, 10.4% aluminum, 10.1% calcium carbide, 7.5% iron oxide, 5.4% calcium nitrate, 3.3% kerosene, 1.4% metallic lithium, 0.30% mixed residues*
19. 05-07-016A: Incendiary composition for starting fires ("Jensen mixture"): *75% magnetic iron oxide, 15% magnesium, 10% silicon*	**20. 05-07-017A: Improved ignition thermite incendiary composition:** *25% barium nitrate, 25% ferrocene, 25% magnesium, 18.7% iron oxide, 6.2% aluminum, 0.10% balance*
21. 05-07-017B: Improved ignition thermite incendiary composition (potassium permanganate containing): *40% potassium permanganate, 30% iron oxide, 20% ferrocene, 10% aluminum*	**22. 05-07-018A "American Greek fire" incendiary composition:** *50.9% potassium nitrate, 21% naphtha, 8.9% wood charcoal, 8.9% sulfur, 7.6% asphaltum, 2.5% antimony, 0.20% combined balance*
23. 05-07-019A: Incendiary composition producing molten metal for causing forest fires and building fires: *76.9% ferrochromium alloy, 20.7% sodium nitrate, 2.3% lime, 0.10% mixed impurities*	**24. 5-07-020A: Classic modified thermite compositions with better ease of ignition:** *61.2% iron-III-oxide, 23% aluminum, 14.6% barium nitrate, 0.9% sulfur, 0.3% castor oil*
25. 05-07-021A: Rapid burning incendiary charge: *75% zirconium metal, 12.5% aluminum/magnesium alloy, 12.5% potassium perchlorate*	**26. 05-07-022A: Elastic formed incendiary agent:** *31% iron oxide, 23% binder, 19% magnesium/aluminum alloy, 15% zirconium metal, 12% barium nitrate*
27. 05-07-023A: NAPALM military incendiary agent for use in non-bursting Napalm bombs (tail ejection bombs): *87% gasoline, 7% aluminum soap of coconut, 4% oleic acid/linoleic acid mixture, 2% lampblack*	**28. 05-07-023B: NAPALM military incendiary agent for use in bursting Napalm bombs (modified):** *84% gasoline, 9% aluminum soap of coconut, 5% oleic acid/linoleic acid mixture, 2% lampblack*
29. 05-07-023C: NAPALM military incendiary agent for non bursting Napalm munitions: *90% gasoline, 5% aluminum soap of coconut, 5% aluminum naphthenate*	**30. 05-07-023D: NAPALM military incendiary agent (modified with lampblack):** *91.5% gasoline, 5% aluminum soap of coconut, 3% aluminum naphthenate, 0.5% lampblack*
31. 05-07-023E: NAPALM military incendiary agent (modified with aluminum oleate): *90% gasoline, 5% aluminum oleate, 4% aluminum soap of coconut, 1% lampblack*	**32. 05-07-023F: NAPALM military incendiary agent (preparation of gelling powder):** *Gelling powder: 47% aluminum salts of cocoanut, 26% aluminum naphthenate, 26% aluminum oleate, 1% diatomaceous earth* *(When mixed with gasoline): 90% gasoline, 10% gelling compound*
33. 05-07-024A: Zinc based incendiary agent for military use: *38.91% dimethylzinc, 19.45% unleaded gasoline, 9.72% potassium perchlorate, 7.78% toluene, 7.78% sodium peroxide, 7.78% aluminum palmitate, 4.66% white phosphorus, 3.89% nitrocellulose, 0.03% mixed balance*	**34. 05-07-025A: Fortified NAPALM incendiary composition (with increased heat output):** *42.85% gasoline, 33.33% potassium perchlorate, 19.04% coarse aluminum, 2.38% aluminum oleate, 1.9% aluminum soap of coconut, 0.47% lampblack, 0.03% residue*
35. 05-07-026A: Incendiary composition producing molten iron: *55.55% aluminum powder, 24.07% sodium nitrate, 9.25% ground silicon, 5.55% iron powder, 5.55% epoxy binder, 0.03%*	**36. 05-07-027A: Modified Thermite incendiary composition producing molten iron:** *57.8% red iron oxide, 28.1% aluminum powder, 12.8% boric oxide, 1.3% zinc stearate*

residual balance	
37. 05-07-028A: Specialty incendiary composition for use in conjunction with magnesium container: *(incendiary composition): 60% sodium nitrate, 40% polymer based binder*	

05-07-001A: Slow burning safety incendiary composition:
Into a suitable mixing bowl or blender, equipped with plastic stirring blade, place ***120 grams of titanium*** powder of about 50 to 150 microns, followed by ***28.5 grams of finely divided elemental boron***, followed by ***40 grams of polytetrafluoroethylene***, and then gently blend for about 10 minutes. Thereafter, add in a toluene solution prepared by adding and dissolving ***10 grams of paraffin*** into 2 milliliters of toluene, and then continue blending the mixture for about 15 to 20 minutes at room temperature. Afterwards, heat the mixture at 60 Celsius for about 30 minutes with moderate blending. After blending for 30 minutes, place the mixture onto a shallow pan, and allow it to air-dry until the smell of toluene is gone. Thereafter, place the mixture into a clean beaker or similar container, and heat to about 60 Celsius with moderate stirring. When the temperature reaches 60 Celsius, pour and press the mixture into any desirable container, grenade body, tube, ect., followed by vibration to remove air-bubbles, and then allow the filled munition to cure for 3 days at room temperature. Requires proper igniter composition.
Burn rate: 1 inch per minute at 78 gram sample.
Flame temperature: 2700+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60.4% titanium, 20.1% polytetrafluoroethylene, 14.3% boron, 5% paraffin, 0.20% residue***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Incendiary grenades and similar munitions.

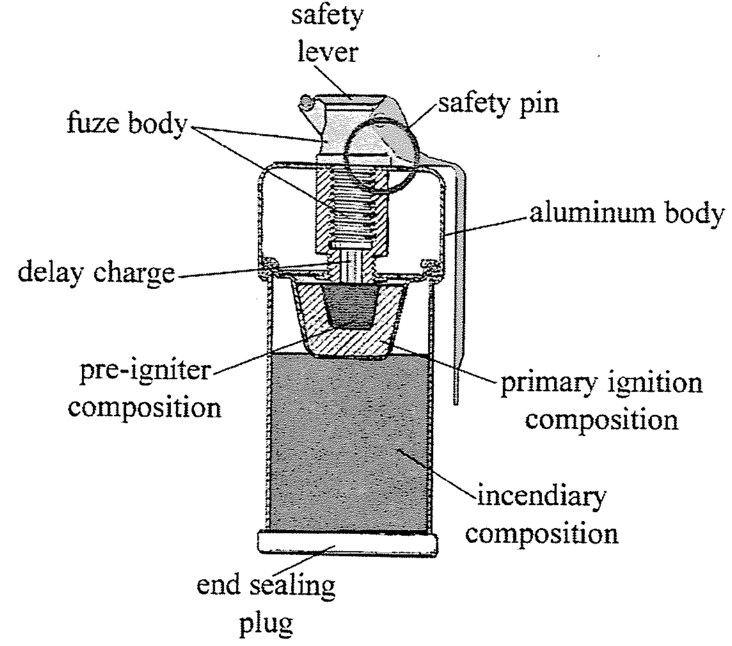
05-07-001B: Slow burning safety incendiary composition (modified):
Into a suitable mixing bowl or blender, equipped with plastic stirring blade, place ***121 grams of titanium*** powder of about 50 to 150 microns, followed by ***28.5 grams of finely divided elemental boron***, followed by ***40 grams of polytetrafluoroethylene***, and then gently blend for about 10 minutes. Thereafter, add in a toluene solution prepared by adding and dissolving ***8 grams of cellulose acetate,*** and ***2 grams of lecithin*** into 15 milliliters of acetone, and then continue blending the mixture for about 15 to 30 minutes at room temperature. Afterwards, heat the mixture at 60 Celsius for about 30 minutes with moderate blending. After 30 minutes, pour and press the mixture into any desirable container, grenade body, tube, ect., followed by vibration to remove air-bubbles, and then allow the filled munition to cure for 3 days at room temperature. Requires proper igniter composition.
Burn rate: 0.9 inches per minute at 79 gram sample.
Flame temperature: 2700+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60.6% titanium, 20% polytetrafluoroethylene, 14.2% boron, 4% paraffin, 1% lecithin, 0.20% residue***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Incendiary grenades and similar munitions.

05-07-002A: Low slag slow burning safety incendiary composition:
Into a suitable mixing bowl or blender, equipped with plastic stirring blade, place ***23.5 grams of carboxyl-terminated butadiene/acrylonitrile copolymer***, followed by ***13 grams of dioctyl adipate***, followed by ***400 milligrams of Fomrez C-2***, and then heat the mixture to 60 Celsius with moderate speed for about 30 minutes. After 30 minutes, add in ***141 grams of titanium powder*** of 50 to 150 microns, followed by ***33 grams of finely divided elemental boron***, and then followed by ***62.5 grams of Teflon RTM***, and then continue to heat and blend the mixture on moderate speed at 60 Celsius for about 15 to 30 minutes. Afterwards, throw in ***3.1 grams of Araldite RTM MY***, and then continue blending the mixture for about 10 to 15 minutes at 60 Celsius. Afterwards, pour and press the mixture into any desirable container, grenade body, tube, ect., followed by vibration to remove air-bubbles, and then allow the filled munition to cure for 3 days at room temperature. Requires proper igniter composition.
Burn rate: 9 inches per minute at 79 gram sample.
Flame temperature: 2700+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50.9% titanium fuel, 22.6% Teflon oxidizer, 11.9% boron fuel promoter, 8.4% copolymer, 4.7% dioctyl adipate plasticizer, 1.1% araldite wetting agent, 0.140% fomrez C-2 curing catalyst***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Incendiary grenades and similar munitions.

05-07-003A: "THERMATE-TH3" standard military incendiary composition:
Into a suitable ball mill, filled with 100 grams of Teflon coated steel shot of 5 millimeters in diameter or so, place ***257.6 grams of finely divided red iron-III-oxide***, followed by ***85.8 grams of standard powdered aluminum***. Thereafter, tumble the mixture at 150 RPM for about 30 minutes. After 30 minutes, stop the tumbling and then place this iron oxide/aluminum mixture into a standard mixing bowl or similar container, equipped with plastic stirring blade, followed by ***10 grams of flours of sulfur***, followed by ***1.5 grams of standard epoxy binder*** or equivalent, and then add in 75 milliliters of acetone, and then moderately blend the mixture for about 15 minutes. Thereafter, add in ***145 grams of barium nitrate***, and then continue to blend the mixture on moderate speed until practically all of the acetone evaporates, and a semi-solid semi-paste remains. Thereafter, press the mixture into any desirable container, grenade body, tube, mold, ect., under mild pressure, and then allow the munition to cure for several days in the usual manner. Requires igniter composition.
Burn rate: Average.
Flame temperature: 3000 Celsius (2800 Celsius average, 3000 Celsius white-hot iron slag).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***51.5% iron oxide, 29% barium nitrate, 17.1% aluminum, 2% sulfur, 0.30% epoxy binder, 0.10% residue***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Incendiary grenades and similar munitions.
Note: Numerous modifications exist.

Classic incendiary grenade



05-07-004A: Improved penetration incendiary composition:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter or so, place ***74.5 grams of titanium*** powder of 50 to 100 mesh, followed by ***38.9 grams of standard powdered silicon***, followed by ***43 grams of standard aluminum powder***, followed by ***9.9 grams of standard epoxy binder*** or equivalent, and then tumble the mixture at 200 RPM for about 10 to 15 minutes. Afterwards, add in ***333 grams of potassium nitrate***, and then continue to tumble the mixture at 200 RPM for 10

minutes. Afterwards, the mixture should be pressed into any desirable container, grenade body, tube, mold, ect., under high pressure (4000 psi), and then allowed to cure for several days or so. Requires igniter composition.
Burn rate: Average
Penetration power: slightly better then thermite.
Flame temperature: 3000+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.6% potassium nitrate, 14.9% titanium, 8.6% aluminum, 7.7% silicon, 1.9% epoxy binder, 0.3% impurities***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Incendiary grenades and similar munitions.
Note: Numerous modifications exist.

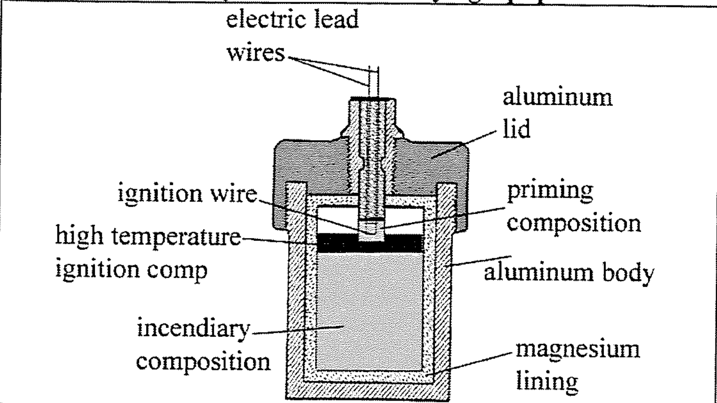
05-07-005A: Metal cutting incendiary composition:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter or so, place ***232.5 grams of calcium sulfate hemihydrate***, followed by ***232.5 grams of standard powdered aluminum***, followed by ***25 grams of finely divided Teflon*** of 35 microns, followed by ***10 grams of flours of sulfur***. Thereafter, tumble the mixture at 200 RPM for about 1 hour. After 1 hour, the mixture is ready for use. To use, it simply needs to be pressed into discs, pellets, or rods of any desirable size under a pressure of 10,000 psi. Requires igniter composition.
Burn rate: Average.
Flame temperature: 3000 Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.5% calcium sulfate, 46.5% aluminum, 5% Teflon, 2% sulfur***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used in incendiary devices to cut steel plates and penetrate metal containers.

05-07-006A: "Floatable" incendiary composition with multiple uses:
Into a suitable mixing bowl, blender or similar mixer, equipped with motorized stirrer utilizing a plastic stir blade, place ***211 grams of magnesium powder*** of 300 to 350 mesh, followed by ***60 grams of a commercially available organopolysiloxane sealant composition containing a hydroxyl end blocked polydimethylsiloxane fluid along with an alkyl orthosilicate compound***, followed by 151 grams of a commercially available solvent "naptholite". Thereafter, blend the mixture on moderate speed for about 10 to 15 minutes to form a uniform mixture. Thereafter, add in ***60 grams of commercially available glass "micro balls" (hollow micro spheres)*** sold by Emerson and Cuming 1G101, and then add in ***30 grams of potassium perchlorate***, and then continue to blend the mixture on moderate speed for about 15 to 30 minutes at room temperature. After 1 hour, quickly add in about ***10 grams of stannous octoate***, and then rapidly blend the mixture for about 1 to 5 minutes, and then pour the mixture into any desirable containers, grenades, tubes, munition body, molds, ect, and then cure these container in an well ventilated oven at 71 Celsius for about 24 hours to remove solvent. Requires standard incendiary ignition composition for proper burn.
Burn rate: Average
Flame temperature: 2500 to 3000 Celsius.
Water resistance: Excellent.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***56.8% magnesium, 16.1% elastomer resin, 16.1% glass micro spheres (flotation aid), 8% potassium perchlorate, 2.6% stannous octoate polymerization catalyst, 0.40% residue***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used in military incendiary munitions of various sizes, can be used commercially for forest fighting, and can be used by ships to protect themselves from infrared guided anti ship missiles.

06-07-007A: Metal cutting incendiary composition used to penetrate steel drums and shipping containers:

Into a suitable mixing bowl, blender or similar mixer, equipped with motorized stirrer utilizing a plastic stir blade, place ***160 grams of a fluoroalkyl phosphate ester*** commercially available and sold under the name, Zonyl S-13, followed by ***60 grams of finely divided iron-III-oxide***, followed by ***60 grams of finely divided silicon of standard mesh***, followed by ***80 grams of potassium perchlorate***. Thereafter, heat the mixture to 55 Celsius, and then blend the mixture at this temperature on moderate speed for about ten minutes. Thereafter, add in ***140 grams of standard powdered magnesium***, and then continue to blend the mixture on moderate speed at 55 Celsius for about 10 to 15 additional minutes. After 10 to 15 minutes, the mixture is ready to be cast. To do so, pour and then vibrate the mixture into any desirable containers, grenades, tubes, munition body, molds, ect, and then cure these containers in an oven at 58 Celsius for about 3 hours. Requires standard incendiary ignition composition for proper burn.
Burn rate: Average.
Flame temperature: 3000 Celsius.
Penetration: 0.04 inches for a 25 gram sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***32% fluoroalkyl phosphate resin, 28% magnesium, 16% potassium perchlorate, 12% iron-III-oxide, 12% silicon***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used to destroy steel drums, canisters, containers, ect.

05-07-008A: Metal cutting incendiary composition:
Into a standard "vertical" ball mill or similar device, filled with about 100 grams or so of Teflon coated steel shot of 5 to 10 millimeters in diameter, place ***275 grams of copper-II-oxide***, followed by ***100 grams of finely powdered aluminum***, followed by ***23 grams of finely divided silicon carbide***, followed by ***100 grams of sodium chlorate***, and then followed by ***2 grams of anhydrous ferric chloride***, and then add in 150 milliliters of hexane, and then rotate the mixture on high for about 30 minutes. After 30 minutes, filter-off the insoluble mass, and then allow it to thoroughly dry in a desiccator filled with any suitable desiccant such as anhydrous calcium chloride, anhydrous magnesium sulfate, ect., and apply a vacuum to the desiccator to remove traces of solvent. Note: drying the mass using vacuum filtration should be avoided. Once all the solvent has been removed, the mixture is ready to be used. To use, simply press it into pellets, discs, ect under a pressure of about 3000 to 6000 psi using the typical hydraulic press. Requires high temperature ignition composition.
Burn rate: Average.
Flame temperature: 3000+ Celsius.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55% copper oxide, 20% aluminum, 20% sodium chlorate, 4.6% silicon carbide, 0.40% ferric chloride***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used to destroy and penetrate metal containers, ect.

Incendiary device for destroying equipment	**Details:**
 electric lead wires aluminum lid ignition wire priming composition high temperature ignition comp aluminum body incendiary composition magnesium lining	Incendiary devices are commonly used to destroy classified documents and similar entities to prevent them from falling into enemy hands. These incendiary devices come in various sizes and types, and some file cabinets come with built in self destruct incendiary agents used to burn the cabinets to the ground if need be.

05-07-009A: "Thermite" incendiary composition:

Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***300 grams of finely divided red iron-III-oxide***, followed by ***100 grams of standard powdered aluminum of average mesh***, and then followed by 200 milliliters of acetone, and then blend the mixture at moderate speed until the bulk of the acetone has evaporated, and a mild pasty mass remains. Once a mild pasty mass remains, place the thermite mixture onto a shallow pan, and allow it to thoroughly air-dry. Once thoroughly air dry, it needs to be pulverized using a ball mill filled with Teflon coated steel shot of the usual diameter and weight for about 1 hour at 200 RPM. Thereafter, the uniform mixture is ready to be pressed. To do so, simply press it into any desirable grenade body, bomb casing, warhead casing, container, tube, ect., under a pressure of about 10,000 psi using any standard hydraulic press of the normal. Note: requires high temperature ignition composition, preferably of the magnesium type.
Burn rate: Average.
Flame temperature: 2400 to 2700 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% iron oxide, 25% aluminum***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used to destroy and penetrate a multitude of metal devices, including vehicles, weapons, containers, ect.
Note: numerous modifications for the preparation of "thermite" exist, and there is really no "set in stone" procedure.

05-07-010A: Modified "Thermite" incendiary composition with easier ignition properties:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***305 grams of finely divided red iron-III-oxide***, followed by ***130 grams of standard powdered aluminum of average mesh***, followed by ***10 grams of potassium perchlorate,*** and then followed by 200 milliliters of acetone, and then blend the mixture at moderate speed until the bulk of the acetone has evaporated, and a mild pasty mass remains. Once a mild pasty mass remains, place the thermite mixture onto a shallow pan, and allow it to thoroughly air-dry. Once thoroughly air dry, it needs to be pulverized using a ball mill filled with Teflon coated steel shot of the usual diameter and weight for about 1 hour at 200 RPM. Thereafter, the uniform mixture is ready to be pressed. To do so, simply press it into any desirable grenade body, bomb casing, warhead casing, container, tube, ect., under a pressure of about 10,000 psi using any standard hydraulic press of the normal. Note: requires proper ignition composition.
Burn rate: Average.
Flame temperature: 2200 to 2700 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***68.5% iron oxide, 29.2% aluminum, 2.2% potassium perchlorate, 0.10% residue***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used to destroy and penetrate a multitude of metal devices, including vehicles, weapons, containers, ect.

05-07-011A: Incendiary composition for breeching lead and other low melting materials:
Into a suitable beaker or similar container, place ***1.36 kilograms of hexamine***, followed by ***2.7 kilograms of sodium peroxide***, and then blend the mixture manual using a plastic spatula or equivalent to form a uniform mixture. Thereafter, allow the mixture to stand at room temperature for about 1 hour. During this 1-hour period, a mild chemical reaction will take place producing a condensation product of sodium peroxide and hexamine. Thereafter, place this combined mixture into a suitable mixing bowl or similar container, equipped with motorized stirrer utilizing a plastic stir blade, followed by 750 milliliters of hexane, and then add in ***2 kilograms of standard cylinder oil*** and then blend the mixture on high until the bulk of the hexane evaporates. When it does, the slurry-like material is ready for use. To use, it simply needs to be placed onto a shallow pan and allowed to thoroughly air-dry. Note: blowing air over the surface of the mixture can help speed up the process. Thereafter, place the dried mixture into a clean beaker or similar container, and then manually blend the mixture using a plastic spatula until a uniform mixture is obtained. Thereafter, press the mixture into any desirable grenade body, container, bomb casing, or the like, and then secure a proper ignition charge.
Burn rate: Average.
Flame temperature: 1200 to 1500+ Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6
Tendency to cake: None.

Explosive ability: None.
Percentage: ***44.5% sodium peroxide, 33% cylinder oil, 22.4% hexamine, 0.10% residue***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used to destroy and penetrate lead and other low melting materials. Can also be used to effectively destroy ammunition.

05-07-012B: Incendiary composition for breeching lead and other low melting materials (modified):
Into a suitable beaker or similar container, place ***125 grams of hexamine***, followed by ***250 grams of sodium peroxide***, and then blend the mixture manual using a plastic spatula or equivalent to form a uniform mixture. Thereafter, allow the mixture to stand at room temperature for about 1 hour. During this 1-hour period, a mild chemical reaction will take place producing a condensation product of sodium peroxide and hexamine. Thereafter, place this combined mixture into a suitable mixing bowl or similar container, equipped with motorized stirrer utilizing a plastic stir blade, followed by 750 milliliters of hexane, and then add in ***125 grams of standard paraffin wax*** (with a melting point of 43 to 65 Celsius), and then blend the mixture on high until the bulk of the hexane evaporates. When it does, the slurry-like material is ready for use. To use, it simply needs to be placed onto a shallow pan and allowed to thoroughly air-dry. Note: blowing air over the surface of the mixture can help speed up the process. Thereafter, place the dried mixture into a clean beaker or similar container, and then manually blend the mixture using a plastic spatula until a uniform mixture is obtained. Thereafter, press the mixture into any desirable grenade body, container, bomb casing, or the like, and then secure a proper ignition charge.
Burn rate: Average.
Flame temperature: 1200 to 1500+ Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% sodium peroxide, 25% paraffin wax, 25% hexamine***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used to destroy and penetrate lead and other low melting materials. Can also be used to safely and effectively destroy ammunition.

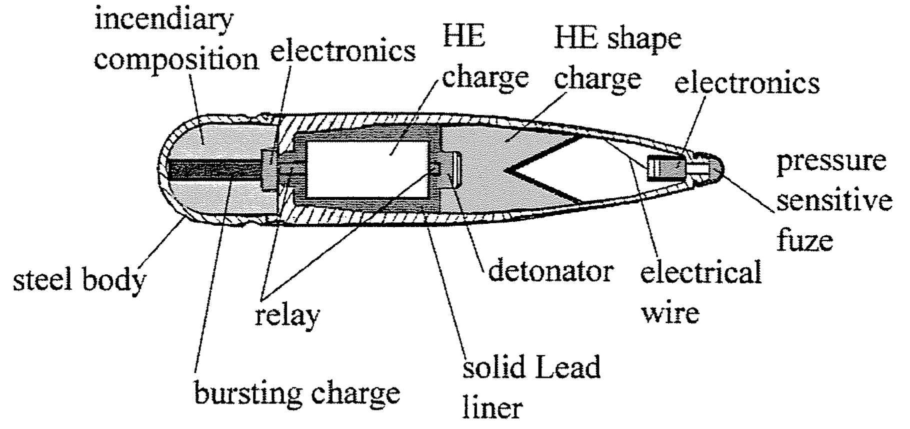
05-07-013A: Incendiary composition with high penetrating power utilizing highly corrosive lithium nitride:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***300 grams of powdered aluminum of average mesh***, followed by ***600 grams of barium nitrate***, followed by ***800 grams of steel shavings,*** and then followed by 500 milliliters of hexane, and then blend the mixture at moderate speed for about 30 minutes. Thereafter, add in ***300 grams of lithium nitride***, and then continue to blend the mixture for about 45 minutes at moderate speed. After 45 minutes, filter-off the insoluble mass, using gravity filtration or vacuum filtration, and then place the filtered-off mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a ball mill filled with Teflon coated steel shot of 10 millimeters in diameter and weight, and then tumble the mixture for about 1 hour at 300 RPM. Thereafter, the uniform mixture is ready to be pressed. To do so, simply press it into any desirable grenade body, bomb casing, warhead casing, container, tube, ect., under a pressure of about 10,000 psi using any standard hydraulic press of the normal usage. Note: requires proper ignition composition.
Burn rate: Average.
Flame temperature: 2000 to 2500 Celsius. Penetrating power is predominately based on the corrosive effects of lithium nitride at elevated temperatures.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% pulverized steel shavings, 30% barium nitrate, 15% aluminum, 15% lithium nitride***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used to penetrate engine blocks, solids metal blocks, and other thick metal containers or materials.

05-07-014A: Slow burning safety incendiary composition (modified):
Into a suitable heated ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***303.5 grams of finely divided titanium of average mesh*** (about 50 to 150 microns), followed by ***71.2 grams of finely divided elemental boron***, followed by ***40 grams of finely powdered polytetrafluoroethylene***, and then tumble the mixture at 100 RPM for about 30 minutes at a temperature of about 32 Celsius. Thereafter, add in a toluene solution prepared by adding and dissolving ***25 grams of chlorinated polyethylene*** (commercially available) into 25 milliliters of toluene, and then continue to tumble the mixture, but increase the RPM to about 200, and tumble at this rotation speed for about 90 minutes at 32 Celsius. After 90 minutes, increase the temperature to about 60 Celsius

and continue to tumble the mixture at 200 RPM for 30 minutes. After 30 minutes, place the mixture onto a shallow pan, and allow it to air-dry until the smell of toluene is gone. Thereafter, place the dried mass into a clean ball mill, filled with clean Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture for about 30 minutes to form a uniform mix. Afterwards, place the finely divided mixture into a clean beaker or similar container, and heat to about 60 Celsius with moderate stirring. When the temperature reaches 60 Celsius, pour and press the mixture into any desirable container, grenade body, tube, ect., followed by vibration to remove air-bubbles, and then allow the filled munition to cure for 3 days at room temperature. Requires proper (high temperature) igniter composition.
Burn rate: 1.6 inches per minute (135 grams per minute).
Slag percentage: 48%
Flame temperature: 2400+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***69% titanium, 16.1% boron, 9% polytetrafluoroethylene, 5.6% chlorinated polyethylene, 0.3% residue***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Incendiary grenades and similar munitions.

05-07-015A: Slurry incendiary composition for generating heat for multiple purposes:
Into a suitable flask, equipped with inert atmosphere by means of a nitrogen bubbler, and equipped with motorized stirrer, place ***375 grams of fluorochlorcarbon oil*** (chlorotrifluoroethane), followed by ***110 grams of finely powdered aluminum*** (paint grade), and then followed by ***15 grams of metallic lithium***, and then blend the mixture for about 30 minutes under a dry nitrogen atmosphere. After 30 minutes, the mixture is ready for use. To use, it needs to be poured into any desirable container made of steel, zinc, or plastic, and then sealed airtight. Requires an igniter composition with a flame temperature of at least 300 Celsius.
Burn rate: Slow.
Heat output: 1400 kcalories per gram.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% fluorochlorocarbon oil, 22% aluminum, 3% metallic lithium***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used to generate heat for causing fires, signals, and for generating electricity using the Peltier principle, and for use in thermopiles.

05-07-015B: Slurry incendiary composition for incendiary purposes (modified):
Into a suitable flask, equipped with inert atmosphere by means of a nitrogen bubbler, and equipped with motorized stirrer, place ***450 grams of fluorochlorcarbon oil*** (chlorotrifluoroethane), followed by ***132 grams of finely powdered aluminum*** (paint grade), followed by ***21 grams of metallic lithium***, followed by ***205 grams of sodium chlorate***, followed by ***75 grams of naphthalene***, followed by ***50 grams of toluene***, and then followed by ***25 grams of standard rubber***, and then blend the mixture for about 30 minutes under a dry nitrogen atmosphere. After 30 minutes, the mixture is ready for use. To use, it needs to be poured into any desirable container made of steel, zinc, or plastic, and then sealed airtight. Can be ignited using any standard methods, but not with electrical squibs or Nichrome wires.
Burn rate: Slow.
Heat output: 1500 Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.9% fluorochlorocarbon oil, 21.3% sodium chlorate, 13.7% aluminum, 7.8% naphthalene, 5.2% toluene, 2.6% rubber, 2.1% metallic lithium, 0.40% mixed residues***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used for destroying metal objects, causing fires, or for use against enemy troops, vehicles, ect.

High Explosive Fragmenting Incendiary artillery shell	Details:
 incendiary composition electronics HE charge HE shape charge electronics pressure sensitive fuze steel body relay detonator electrical wire bursting charge solid Lead liner	High explosive fragmenting incendiary rounds are designed to destroy buildings. When the shell impacts with the side of a building, the shape charge penetrates a hole through the buildings wall. Thereafter, a high explosive charge enters the building and then detonates. A fraction of a second later, the incendiary charge detonates, showering the inside of the building/room with high temperature burning incendiary fragments, thereby causing a large un-controlled fire.

05-07-015C: Slurry incendiary composition for incendiary purposes (modified 2):
Into a suitable mixing bowl, blender, container, ect., equipped with a motorized stirrer, place ***456 grams of fluorochlorcarbon oil*** (chlorotrifluoroethane), followed by ***108 grams of finely powdered aluminum*** (paint grade), followed by ***15 grams of metallic lithium***, followed by ***181 grams of manganese dioxide***, followed by ***105 grams of finely divided calcium carbide***, followed by ***78 grams of finely divided red iron-III-oxide***, followed by ***35 grams of kerosene***, and then followed by ***56 grams of calcium nitrate***, and then blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for use. To use, it needs to be poured into any desirable container made of steel, zinc, or plastic, and then sealed airtight. Can be ignited using any standard methods, but not with electrical squibs or Nichrome wires.
Burn rate: Slow.
Heat output: 1800+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44.1% fluorochlorocarbon oil, 17.5% manganese dioxide, 10.4% aluminum, 10.1% calcium carbide, 7.5% iron oxide, 5.4% calcium nitrate, 3.3% kerosene, 1.4% metallic lithium, 0.30% mixed residues***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used for destroying metal objects, causing fires, or for use against enemy troops, vehicles, ect.

05-07-016A: Incendiary composition for starting fires ("Jensen mixture"):
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***75 grams of finely powdered magnesium***, followed by ***50 grams of finely powdered silicon***, and then followed by ***375 grams of finely powdered magnetic iron oxide***, and then tumble the mixture for about 1 hour at 300 RPM to form a uniform mixture. Thereafter, the mixture is ready to be used. To do so, it should be pressed into pellets, tablets, rods, discs, or pressed into any desirable container under a pressure of about 9000 psi. Should be ignited using a high temperature ignition composition under the usual manner.
Burn rate: Above moderate.
Heat output: 1500 to 1900 Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% magnetic iron oxide, 15% magnesium, 10% silicon***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used in making fire starting grenades and other munitions.

05-07-017A: Improved ignition thermite incendiary composition:
Into a suitable mixing bowl, blender, container, ect., equipped with a motorized stirrer, place ***75 grams of finely divided red iron-III-oxide***, followed by ***25 grams of finely powdered aluminum*** of average mesh, followed by ***100 grams of barium nitrate***, followed by ***100 grams of ferrocene***, and then followed by ***100 grams of finely powdered magnesium***. Thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture until the bulk of the ether evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or

pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill filled with Teflon coated steel shot of the usual size and weight, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the uniform mixture is ready for use. To use, it needs to be pressed into any grenade body, tube, container, ect., ect., under high pressure in the usual manner. Can be ignited using any ignition composition, but still may not ignite properly if using a hot wire, Nichrome, or electric squib.
Burn rate: Slow.
Heat output: 2000+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***25% barium nitrate, 25% ferrocene, 25% magnesium, 18.7% iron oxide, 6.2% aluminum, 0.10% balance***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used in incendiary munitions.

05-07-017B: Improved ignition thermite incendiary composition (potassium permanganate containing):
Into a suitable mixing bowl, blender, container, ect., equipped with a motorized stirrer, place ***75 grams of finely divided red iron-III-oxide***, followed by ***25 grams of finely powdered aluminum*** of average mesh, and then followed by ***100 grams of potassium permanganate***, followed by ***50 grams of ferrocene***. Thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture until the bulk of the ether evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill filled with Teflon coated steel shot of the usual size and weight, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the uniform mixture is ready for use. To use, it needs to be pressed into any grenade body, tube, container, ect., ect., under high pressure in the usual manner. Can be ignited using any ignition composition, but still may not properly ignite if using a hot wire, Nichrome, or electric squib.
Burn rate: Slow.
Heat output: 2000+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% potassium permanganate, 30% iron oxide, 20% ferrocene, 10% aluminum***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Used in incendiary munitions.

05-07-018A: "American Greek fire" incendiary composition:
Into a large beaker or similar container, equipped with motorized stirrer, place ***500 grams of naphtha***, and then add in ***1209.5 grams of potassium nitrate***, followed by ***211.6 grams of finely powdered wood charcoal***, followed by ***181.4 grams of asphaltum***, followed by ***60.4 grams of finely divided antimony***, followed by ***211.6 grams of sulfur***, and then blend the mixture on moderate speed for about 1 hour at room temperature. After blending for about 1 hour, the mixture is ready for use. To use, the wet mass needs to be placed casually into any desirable container, preferably a container that will rupture on impact, i.e., a suitable hand thrown, airdropped container, or other container. Also, for hand thrown devices, the desired container will have to be shaken up before use, as the solid contents of the mixture will settle-out. For hand thrown devices, a standard grenade fuse similar in nature to those used in smoke grenades should be used for ignition. For airdropped or rocket launched devices, a black powder bursting charge should be used for initiation.
Burn rate: Burns vigorously and hot—average.
Heat output: 1000+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***50.9% potassium nitrate, 21% naphtha, 8.9% wood charcoal, 8.9% sulfur, 7.6% asphaltum, 2.5% antimony, 0.20% combined balance***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used in incendiary munitions for starting fires, and in "Malakoff" cocktails.

05-07-019A: Incendiary composition producing molten metal for causing forest fires and building fires:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***680 grams of high silicon content ferrochromium*** (commercially available), followed by ***183.7 grams of sodium nitrate***, and then followed by ***20.4 grams of finely powdered lime***, and then tumble the mixture for about 1 hour at 150 to 200 RPM to form a uniform mixture. Thereafter, the mixture is ready to be used. To do so, it should be pressed into pellets, tablets, rods, discs, or pressed into any desirable container under a pressure of about 15,000 psi. Should be ignited using a magnesium composition.
Burn rate: Average.
Heat output: 1500 to 2000 Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***76.9% ferrochromium alloy, 20.7% sodium nitrate, 2.3% lime, 0.10% mixed impurities***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used in incendiary munitions for starting fires.

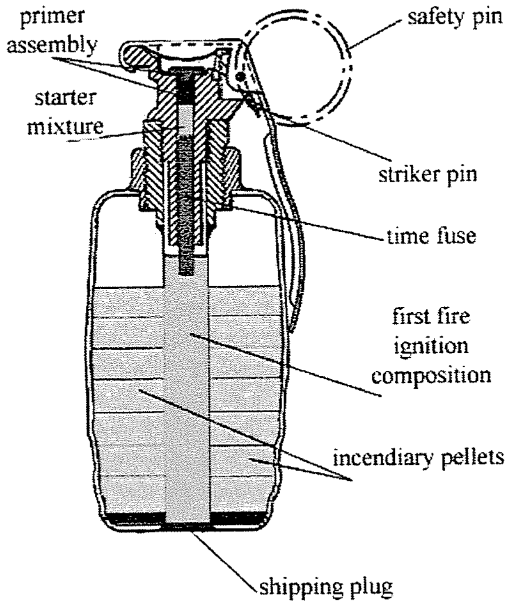
05-07-020A: Classic modified thermite compositions with better ease of ignition:
Into a suitable mixing bowl, blender, container, ect., equipped with a motorized stirrer in the usual means, place ***306 grams of finely divided red iron-III-oxide***, followed by ***115 grams of finely powdered aluminum*** of average size, followed by ***73 grams of barium nitrate***, followed by ***4.5 grams of flours of sulfur***, and then followed by ***1.5 grams of castor oil***. Thereafter, add in 150 milliliters of diethyl ether or acetone, and then blend the mixture until the bulk of the ether evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill filled with Teflon coated steel shot of the usual size and weight, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the uniform mixture is ready for use. To use, it needs to be pressed into any grenade body, tube, container, ect., ect., under high pressure in the usual manner. Event though this composition is easier to ignite then thermite itself, you should use a suitable magnesium containing ignition composition for proper burn.
Burn rate: Average.
Heat output: 2000+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6+
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***61.2% iron-III-oxide, 23% aluminum, 14.6% barium nitrate, 0.9% sulfur, 0.3% castor oil***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used in incendiary munitions for starting fires.

05-07-021A: Rapid burning incendiary charge:
Into a suitable mixing bowl, blender, container, ect., equipped with a motorized stirrer in the usual means, place ***225 grams of finely divided zirconium metal of 60 mesh***, followed by ***37.5 grams of a finely divided alloy containing 50% aluminum, and 50% magnesium***, and then followed by ***37.5 grams of potassium perchlorate***. Thereafter, add in 150 milliliters of acetone, and then blend the mixture until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill filled with Teflon coated steel shot of the usual size and weight, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform mixture. Thereafter, the uniform mixture is ready for use. To use, it needs to be pressed into any grenade body, tube, container, ect., ect., under high pressure in the usual manner. Can be readily ignited using any suitable means.
Burn rate: Above average.
Heat output: 2000+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***75% zirconium metal, 12.5% aluminum/magnesium alloy, 12.5% potassium perchlorate***
Classification: Deflagrating explosive (classified as incendiary agent).

Use: Can be used in incendiary munitions for starting fires.

05-07-022A Elastic formed incendiary agent:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter, place ***75 grams of barium nitrate***, followed by ***200 grams of red iron-III-oxide***, followed by ***120 grams of a finely powdered magnesium/aluminum alloy*** containing 50% magnesium and 50% aluminum, and then followed by ***100 grams of finely powdered zirconium metal.*** Thereafter, tumble the mixture at 200 RPM for about 1 hour to form a uniform mixture. Note: keep the ball mill sealed and equipped with a drying tube to exclude air, and use caution, as the mixture may be pyrophoric. Thereafter, quickly place the tumbled mixture into a mixing bowl or blender, equipped with motorized stirrer in the usual means, and then add in ***151.8 grams of an anaerobic binder***, which is based on methacrylate resin (with a viscosity of 5,000 cp), and then blend the mixture for about 5 to 10 minutes to form a uniform mixture. Thereafter the mixture is ready to be hardened. To do so, pour and vibrate the semi fluidized mass into any desirable grenade body, shell, tube, ect., in the normal fashion, and then cure the munitions in an oven at 60 Celsius for about 12 hours. Note: the munitions should be sealed airtight prior to the curing process, as the hardener will set in the presence of air. Should be ignited using a suitable magnesium containing composition.
Burn rate: Average.
Heat output: 2000+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***31% iron oxide, 23% binder, 19% magnesium/aluminum alloy, 15% zirconium metal, 12% barium nitrate***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used in incendiary munitions for grenades, mortars, and artillery shells.

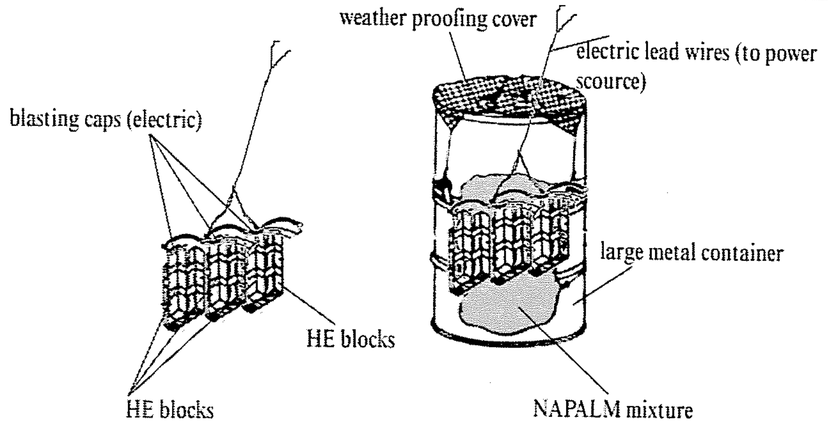
Standard incendiary grenade



05-07-023A: NAPALM military incendiary agent for use in non-bursting Napalm bombs (tail ejection bombs):
Into a suitable mixing drum, equipped with motorized stirrer, place ***70 grams of aluminum salts of coconut oil*** (aluminum soap of coconut), followed by ***20 grams of finely ground lampblack***, and then followed by ***870 grams of regular super unleaded gasoline.*** Thereafter, blend the mixture for about 5 minutes, and then add in ***40 grams of a mixture containing 40% oleic acid, and 60% linoleic acid (Neo-Fat 3R)***, and then continue to blend the mixture for about 15 minutes to form a uniform gel. Thereafter, the gel is ready for packing. For packing, the gel simply needs to be lightly pressed into any desirable bomb casing in the usual loading means. Not recommend for "bursting" type munitions.
Burn rate: 100 c.c. sample will burn for 3 minutes (estimated).
Heat output: N/A
Water resistance: Very good.
Stability: Can be stored for many years, but should be used within 18 months if applicable.

Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 9 (based on ignition of flammable liquids).
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***87% gasoline, 7% aluminum soap of coconut, 4% oleic acid/linoleic acid mixture, 2% lampblack***
Classification: Highly flammable semi-liquid.
Use: Widely used in military napalm bombs for various operations.

Classic napalm anti-personnel bomb

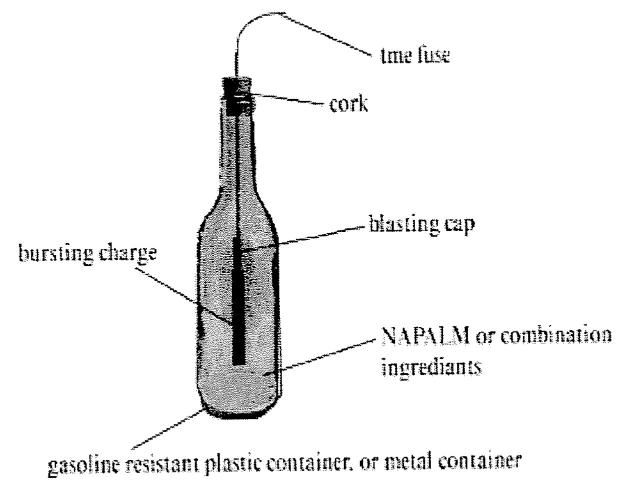


Details:

Improvised explosive devices, such as the above napalm bomb, are used to take down enemy personnel at a predetermined time during a battle. These improvised munitions are made by filling a large container with Napalm, and then inserting a high explosive bursting charge. When the explosive charge is fired, it blows apart the container, spreading burning napalm over a wide area.

05-07-023B: NAPALM military incendiary agent for use in bursting Napalm bombs (modified):
As in the previous example, into a suitable mixing drum, equipped with motorized stirrer, place ***90 grams of aluminum salts of coconut oil*** (aluminum soap of coconut), followed by ***20 grams of finely ground lampblack***, and then followed by ***840 grams of regular super unleaded gasoline.*** Thereafter, blend the mixture for about 5 minutes, and then add in ***50 grams of a mixture containing 40% oleic acid, and 60% linoleic acid (Neo-Fat 3R)***, and then continue to blend the mixture for about 15 minutes to form a uniform gel. Thereafter, the gel is ready for packing. For packing, the gel simply needs to be lightly pressed into any desirable bomb casing in the usual loading means. This composition is preferred for bursting type bombs.
Burn rate: 100 c.c. sample will burn for 3 minutes (estimated).
Heat output: N/A
Water resistance: Very good.
Stability: Can be stored for many years, but should be used within 18 months if applicable.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 9 (based on ignition of flammable liquids).
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***84% gasoline, 9% aluminum soap of coconut, 5% oleic acid/linoleic acid mixture, 2% lampblack***
Classification: Highly flammable semi-liquid.
Use: Widely used in military napalm bombs for various operations.

Improvised Napalm munition (INM)	**Description:**

 tme fuse cork blasting cap bursting charge NAPALM or combination ingrediants gasoline resistant plastic container, or metal container	Basic Molotov cocktail design utilizing a non-glass bottle. The bottle should be made of gasoline resistant plastic, tin, aluminum, or any other desired metal. The weight of the bursting charge should only be 10% of the total weight of the flammable composition. The bursting charge can be any desired HE—prime with a non-electric blasting cap. The length of the time fuse should give you at least 3 minutes burning time to allow proper distance between arming and throwing the device. If desired, you can rig entire areas, roads, hallways, doorways, windows, ect., with multiple bursting type Molotov cocktails, and then wire the entire system, using electrical means, for use in ambushing, protecting camps, hideouts, and the like
Formula 1: a) 90 parts NAPALM; b) 5 parts magnesium powder; c) 5 parts red phosphors	**Formula 5:** a) 60 parts of diesel fuel; b) 20 parts of powdered iron; c) 10 parts of toluene; d) 10 parts of potassium dichromate
Formula 2: a) 75 parts NAPALM; b) 10 parts magnesium powder; c) 10 parts metallic sodium; d) 5 parts kerosene	**Formula 6:** a) 40 parts of diethyl ether; b) 40 parts of crude oil; c) 10 parts powdered magnesium; d) 10 parts of potassium nitrate
Formula 3: a) 75 parts NAPALM; b) 5 parts potassium permanganate; c) 5 parts of white phosphorus; d) 15 parts of oil	**Formula 7:** a) 50 parts of toluene or benzene; b) 25 parts of white phosphorus; c) 15 parts of rubber; d) 10 parts of powdered magnesium
Formula 4: a) 50 parts of NAPALM; b) 25 parts of sodium peroxide; c) 25 parts of powdered aluminum	**Formula 8:** a) 75 parts of fuel oil; b) 15 parts potassium chlorate; 5 parts of red iron oxide; d) 5 parts of red phosphorus

05-07-023C: NAPALM military incendiary agent for non-bursting Napalm munitions:
Into a suitable mixing drum, equipped with motorized stirrer, place ***900 grams of super unleaded gasoline***, and then add in ***50 grams of aluminum naphthenate***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***50 grams of aluminum soap of coconut,*** and then continue to blend the mixture for about 20 minutes. Thereafter, the gel is ready for packing. For packing, the gel simply needs to be lightly pressed into any desirable bomb casing in the usual loading means. This composition is not preferred for bursting type bombs.
Burn rate: 100 c.c. sample will burn for 2 to 3 minutes (estimated).
Heat output: N/A
Water resistance: Very good.
Stability: Can be stored for many years, but should be used within 18 months if applicable.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 9 (based on ignition of flammable liquids).
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***90% gasoline, 5% aluminum soap of coconut, 5% aluminum naphthenate***
Classification: Highly flammable semi-liquid.
Use: Widely used in military napalm bombs for various operations.

05-07-023D: NAPALM military incendiary agent (modified with lampblack):
Into a suitable mixing drum, equipped with motorized stirrer, place ***915 grams of super unleaded gasoline***, and then add in ***30 grams of aluminum naphthenate***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***50 grams of aluminum soap of coconut,*** and then followed by ***5 grams of finely powdered lampblack***, and then continue to blend the mixture for about 20 minutes. Thereafter, the gel is ready for packing. For packing, the gel simply needs to be lightly pressed into any desirable bomb casing in the usual loading means. This composition can be used in bursting type bombs.
Burn rate: 100 c.c. sample will burn for 2 to 3 minutes (estimated).
Heat output: N/A
Water resistance: Very good.
Stability: Can be stored for many years, but should be used within 18 months if applicable.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 9 (based on ignition of flammable liquids).
Tendency to cake: None
Explosive ability: Stable.

Percentage: ***91.5% gasoline, 5% aluminum soap of coconut, 3% aluminum naphthenate, 0.5% lampblack***
Classification: Highly flammable semi-liquid.
Use: Widely used in military napalm bombs for various operations.

05-07-023E: NAPALM military incendiary agent (modified with aluminum oleate):
Into a suitable mixing drum, equipped with motorized stirrer, place ***900 grams of super unleaded gasoline***, and then add in ***50 grams of aluminum oleate.*** Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***40 grams of aluminum soap of coconut,*** and then followed by ***10 grams of finely powdered lampblack***, and then continue to blend the mixture for about 20 minutes. Thereafter, the gel is ready for packing. For packing, the gel simply needs to be lightly pressed into any desirable bomb casing in the usual loading means. This composition can be used in bursting type bombs.
Burn rate: 100 c.c. sample will burn for 3 ½ minutes (estimated).
Heat output: N/A
Water resistance: Very good.
Stability: Can be stored for many years, but should be used within 18 months if applicable.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 9 (based on ignition of flammable liquids).
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***90% gasoline, 5% aluminum oleate, 4% aluminum soap of coconut, 1% lampblack***
Classification: Highly flammable semi-liquid.
Use: Widely used in military napalm bombs for various operations.

05-07-023F: NAPALM military incendiary agent (preparation of gelling powder):
Into a suitable beaker or similar container, place ***50 grams of cocoanut oil fatty acids***, followed by ***25 grams of naphthenic acid***, followed by ***25 grams of oleic acid***, and then gently heat the mixture to melt the fatty acid mixture. Now, make a solution by adding and dissolving ***23 grams of sodium hydroxide*** into 1000 milliliters of ice water. Note: sodium hydroxide generates heat when dissolved in water so allow the solution to cool before using. Thereafter, add this sodium hydroxide solution to the warm fatty acid mixture, and them immediately raise the temperature of the mixture to 65 Celsius and the blend the mixture for about 10 minutes. Thereafter, add in 10 grams of activated carbon, and then continue to blend the mixture for 5 minutes. Now, filter the mixture to remove insoluble materials, and then place the clear filtered mixture into a water bath and cool it to room temperature. Once its temperature reaches room temperature, add in ***20 grams of diatomaceous earth***, and then blend the mixture for about 5 minutes. Now, prepare another solution by adding and dissolve 74 grams of aluminum sulfate 18 hydrate to 200 milliliters of water. Now, slowly add drop wise, this aluminum sulfate solution to the cool mixture containing the diatomaceous earth, and stir the mixture during the addition. After the addition of the aluminum sulfate solution, stir the total mixture for about 10 minutes, and then filter-off any insoluble material. Thereafter, wash this filtered-off mass with a little cold water, and then vacuum dry or air dry it in an oven at 50 Celsius. Note: a second crop of product can be obtained by treating the filtered liquid with additional diatomaceous earth, followed by a little water, followed by filtration to recover more product. Once the total amount of dry product has been obtained, it is ready for gelling gasoline. Note: this dry solid product can be stored for many years and used whenever desired. When desired, mix 1 part of the dry product with 9 parts of unleaded gasoline and blend the total mixture for about 10 minutes to form a fine gel. Note: in some cases, stirring will not even be needed, as the gelling power of the dry solid product is very powerful.
Burn rate: 100 c.c. sample will burn for 3 ½ minutes (estimated).
Heat output: N/A
Water resistance: Very good.
Stability: Can be stored for many years, but should be used within 18 months if applicable.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 9 (based on ignition of flammable liquids).
Tendency to cake: None
Explosive ability: Stable.
Percentage: Gelling powder: ***47% aluminum salts of cocoanut, 26% aluminum naphthenate, 26% aluminum oleate, 1% diatomaceous earth***
(When mixed with gasoline): ***90% gasoline, 10% gelling compound***
Classification: Highly flammable semi-liquid.
Use: Widely used in military napalm bombs for various operations.

05-07-024A: Zinc based incendiary agent for military use:
Into a suitable sealed mixing drum, equipped with motorized stirrer and utilizing an inert atmosphere, place ***100 grams of dry toluene*** followed by ***500 grams of dimethylzinc***, followed by ***50 grams of nitrocellulose***, followed by ***125 grams of potassium perchlorate***, followed by ***60 grams of white phosphorus***, and then followed by ***100 grams of sodium peroxide*** (95% purity). Thereafter, blend the mixture for about 10 minutes, and then add in ***100 grams of aluminum palmitate***, followed by ***250 grams of super unleaded gasoline***, and then blend the mixture on moderate speed for about 1 hour at room temperature. Thereafter, the jelly-like mass is ready for

packing. To do so, simply pack the messy mixture into any desirable shell, bomb, warhead, container, ect. To properly use the mixture, a small bursting charge should be inserted in the center of the munitions to expel the mixture upon ignition. **Note: dimethylzinc and white phosphorus ignite spontaneously when exposed to air.**

Burn rate: Typical for gelled fuels.
Heat output: 650 to 1000 Celsius.
Water resistance: Moderate—protect from moisture.
Stability: Can be stored for several decades or less.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): N/A
Tendency to cake: None
Explosive ability: None. Possibly under severe conditions.
Percentage: ***38.91% dimethylzinc, 19.45% unleaded gasoline, 9.72% potassium perchlorate, 7.78% toluene, 7.78% sodium peroxide, 7.78% aluminum palmitate, 4.66% white phosphorus, 3.89% nitrocellulose, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as incendiary agent).
Use: Can be used in incendiary munitions for grenades, mortars, artillery shells, bombs, rockets, and improvised munitions.

05-07-025A: Fortified NAPALM incendiary composition (with increased heat output):
Into a suitable mixing drum, equipped with motorized stirrer, place ***900 grams of super unleaded gasoline***, and then add in ***50 grams of aluminum oleate***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***40 grams of aluminum soap of coconut***, and then followed by ***10 grams of finely powdered lampblack***, and then continue to blend the mixture for about 20 minutes. Thereafter, add in ***400 grams of coarse aluminum***, followed by ***700 grams of potassium perchlorate***, and then continue to blend the gel mixture for about 10 to 15 minutes to evenly disperse the aluminum and perchlorate throughout the mixture. Thereafter, the gel-like mixture is ready for packing. For packing, the gel-like composition simply needs to be lightly pressed into any desirable bomb casing in the usual means. This composition can be used in bursting type bombs.

Burn rate: N/A
Heat output: N/A
Water resistance: Very good.
Stability: Can be stored for many years, but should be used within 18 months if applicable.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 9+ (based on ignition of flammable liquids).
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***42.85% gasoline, 33.33% potassium perchlorate, 19.04% coarse aluminum, 2.38% aluminum oleate, 1.9% aluminum soap of coconut, 0.47% lampblack, 0.03% residue***
Classification: Highly flammable semi-liquid.
Use: Can be used in military napalm bombs for various operations.

05-07-026A: Incendiary composition producing molten iron:
Into a suitable ball or vertical mixer, filled with Teflon coated steel shot, place ***300 grams of aluminum powder***, followed by ***30 grams of iron powder***, and then followed by ***50 grams of finely ground silicon***. Thereafter, tumble the mixture at 100 RPM for about 30 to 40 minutes. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***130 grams of sodium nitrate***, and then followed by ***30 grams of any desired epoxy binder***. Thereafter, blend the mixture on high speed for about 30 to 40 minutes in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable mold, container, tube, grenade body, ect., and then allowed to cure under the usual conditions. Should be primed with a suitable ignition composition.

Burn rate: Average.
Heat output: 1200 Celsius.
Water resistance: Very good.
Stability: Stable.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***55.55% aluminum powder, 24.07% sodium nitrate, 9.25% ground silicon, 5.55% iron powder, 5.55% epoxy binder, 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in incendiary devices for the usual operations.

05-07-027A: Modified Thermite incendiary composition producing molten iron:

Into a suitable ball or vertical mixer, filled with Teflon coated steel shot, place ***140.5 grams of aluminum powder***, followed by ***64 grams of boric oxide***, followed by ***6.5 grams of zinc stearate***, and then followed by ***289 grams of red iron oxide***. Thereafter, tumble the mixture at 150 RPM for about 30 to 40 minutes. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 75 milliliters of ether, and then blend the mixture on moderate speed for about 15 minuets. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable mold, container, tube, grenade body, ect., and then cured under the usual conditions. Should be primed with a suitable ignition composition.

Burn rate: Average.
Heat output: 2100 Celsius.
Water resistance: Very good.
Stability: Stable.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 4
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***57.8% red iron oxide, 28.1% aluminum powder, 12.8% boric oxide, 1.3% zinc stearate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in incendiary devices for the usual operations.

05-07-028A: Specialty incendiary composition for use in conjunction with magnesium container:
Into a suitable beaker or similar container equipped with motorized stirrer, place ***120 grams of divinyl acetylene polymer*** (commercially available), followed by ***30 grams of xylene***. Thereafter, blend the mixture for about 10 to 15 minutes. Thereafter, add in ***50 grams of any desired heavy petroleum oil*** (such as 10W30 motor oil), and then followed by ***300 grams of sodium nitrate***. Thereafter, blend the mixture for about 45 minutes at room temperature. Thereafter, heat the mixture with constant stirring to about 85 Celsius for about 16 hours. Note: polymerization will occur during the heating process. After the 16-hour heating process, remove the heat source and allow the mixture to cool to room temperature. Note: during the cool down period, the mixture should be manually kneaded (like kneading bread dough) as the mixture cools down to room temperature. Thereafter, the kneaded cooled mass is then ready for use. Now, to maximize the incendiary effect of the composition, it should be pressed into magnesium tubes, or containers at 2000 psi. The magnesium tubes/containers should have a wall thickness of no greater then 5 millimeters. A proper ignition charge should be used to initiate the mixture. Note: once the composition begins to burn, it will ignite the magnesium tube/container producing a brilliant burning mass.

Burn rate: Average.
Heat output: 2100 Celsius.
Water resistance: Very good.
Stability: Stable.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None
Explosive ability: Stable.
Percentage (incendiary composition): ***60% sodium nitrate, 40% polymer based binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used as an incendiary agent for starting building fires.

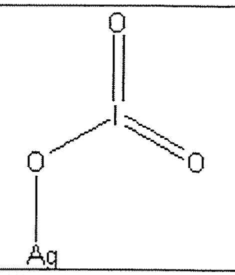
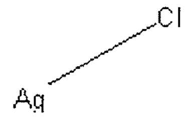
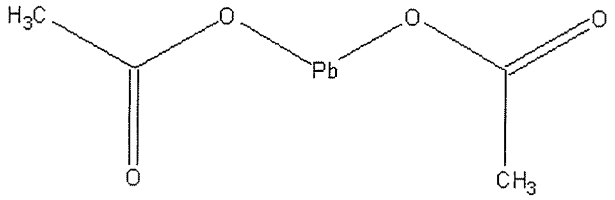
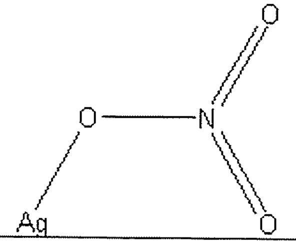
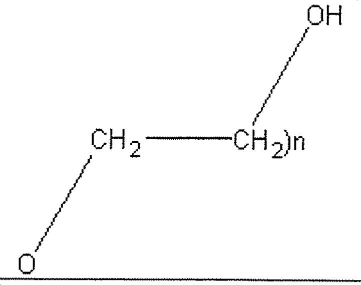
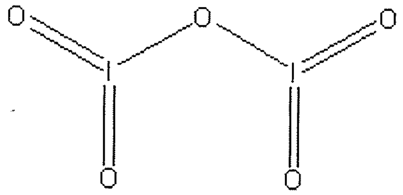
6. Specialty non-Propellant Pyrotechnic Compositions

Section 1: Cloud Seeding Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)	**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)	**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)	**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)	**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)	**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)	**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)	**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)	**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)	**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)	**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)	**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)	**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)	**129. Bismuth Subnitrate (see Smoke Generating Compositions)**

130. Calcium Iodate (see Smoke Generating Compositions)		**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)		**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)		**135. Potassium Ferriccyanide (see Priming/Igniter Compositions)**
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)		**137. Bismuth Trioxide (see Priming/Igniter Compositions)**
138. Titanium powder (see Priming/Igniter Compositions)		**139. Tungsten powder (see Priming/Igniter Compositions)**
140. Lead Powder (see Priming/Igniter Compositions)		**141. Lead-II-Oxide (red lead; litharge) (see Priming/Igniter Compositions)**
142. Selenium powder (see Priming/Igniter Compositions)		**143. Sodium Bicarbonate (see Priming/Igniter Compositions)**
144. Iron powder (see Priming/Igniter Compositions)		**145. Silicon Dioxide (see Priming/Igniter Compositions)**
146. Lead Thiocyanate (see Priming/Igniter Compositions)		**147. Para-Nitrotoluene (see Priming/Igniter Compositions)**
148. Silver powder (see Priming/Igniter Compositions)		**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)		**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)		**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)		**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)		**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)		**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate (see Illumination/Flare and Signaling Compositions)		**161. Iodoform (see Illumination/Flare and Signaling Compositions)**
162. Lithium Nitrate (see Illumination/Flare and Signaling Compositions)		**163. Manganese Oxide (see Illumination/Flare and Signaling Compositions)**
164. Sodium Carbonate (see Illumination/Flare and Signaling Compositions)		**165. Molybdenum powder (see Illumination/Flare and Signaling Compositions)**
166. Sodium Oxalate (see Illumination/Flare and Signaling Compositions)		**167. Oxalic Acid (see Illumination/Flare and Signaling Compositions)**
168. Stearic acid (see Illumination/Flare and Signaling Compositions)		**169. Thorium Nitrate (see Illumination/Flare and Signaling Compositions)**
170. Cerium Nitrate (see Illumination/Flare and Signaling Compositions)		**171. Rubidium Nitrate (see Illumination/Flare and Signaling Compositions)**
172. Calcium metal (see Illumination/Flare and Signaling Compositions)		**173. Mercury-II-Chloride (see Illumination/Flare and Signaling Compositions)**
174. Zirconium Carbonate (see Illumination/Flare and Signaling Compositions)		**175. Barium Chloride (see Illumination/Flare and Signaling Compositions)**
176. Antimony powder (see Pyrotechnic Delay Compositions)		**177. Chromium metal (see Pyrotechnic Delay Compositions)**
178. Zinc powder (see Pyrotechnic Delay Compositions)		**179. Tin Dioxide (see Pyrotechnic Delay Compositions)**
180. Silver-I-Chromate (see Pyrotechnic Delay Compositions)		**181. Calcium Chromate (see Pyrotechnic Delay Compositions)**
182. Strontium Chromate (see Pyrotechnic Delay Compositions)		**183. Silver-I-Oxide (see Pyrotechnic Delay Compositions)**
184. Calcium Fluoride (see Pyrotechnic Delay Compositions)		**185. Paraffin (see Incendiary Agents)**
186. Sodium Peroxide (see Incendiary Agents)		**187. Metallic Lithium (see Incendiary Agents)**
188. Calcium Carbide (see Incendiary Agents)		**189. Ferrocene (see Incendiary Agents)**
190. Lime (calcium oxide) (see Incendiary Agents)		**191. Aluminum Oleate (see Incendiary Agents)**
192. Aluminum Palmitate (see Incendiary Agents)		**193. Zinc Stearate (see Incendiary Agents)**
194. Silver Iodate		**195. Silver-Chloride**

		
Forms a white crystalline powder, crystals, or granules. The crystals have a melting point of 200 Celsius, with decomposition beginning shortly thereafter. The solid is light sensitive so protect from light. The solid is soluble in water, but insoluble in most solvents.		Forms a fine white powder or crystalline solid. The solid is light sensitive, so the product should be kept in amber glass bottles in a cool dry place. Silver chloride is insoluble in water and all common solvents.
196. Lead Acetate		**197. Silver Nitrate**
		
Forms a trihydrate, which forms colorless crystals or white powder. The crystals melt when rapidly heated to 75 Celsius, and begin to decompose when heated above 100 Celsius. Lead acetate is one of only a few lead compounds that are soluble in water.		Forms brilliant colorless crystals, a white powder. The crystals have a melting point of 212 Celsius, with decomposition beginning at higher temperatures. The solid is soluble in water, but only moderately soluble in alcohol.
198. Polyethylene Glycol		**199. Iodine Pentoxide**
		
Various varieties exist ranging from 200 to 4000 carbons. The most common form contains around 200 carbons, which is a viscous liquid. The higher grades contain solids within liquid forms. Boiling points and melting points may vary depending on commercial product.		Forms brilliant colorless crystalline needles, lumps, or powder. The solid may be colored pink to pinkish gray depending on commercial grade. The solid is a powerful oxidizing agent, so users should use caution. The crystals have a melting point of 275 Celsius, with decomposition beginning at higher temperatures. Iodine pentoxide dissolves in water with the formation of Iodic acid. The crystals are insoluble in most solvents.

- Cloud Seeding Compositions in this section -

1. 06-01-001A: Cloud seeding pyrotechnic composition: *71% silver iodate, 10.6% aluminum, 7.2% standard epoxy binder, 6% hexachlorobenzene, 5.1% magnesium, 0.10% impurities*	**2. 06-01-002A: Cloud seeding pyrotechnic composition:** *43.7% potassium iodate, 24% silver iodate, 18% aluminum, 8.1% magnesium, 6% epoxy binder, 0.2% impurities*
3. 06-01-003A: Cloud seeding and valley fog dispersion pyrotechnic composition for producing local precipitation: *41.3% aluminum, 34.4% sodium nitrate, 24.1% sodium chloride, 0.20% moisture and impurities*	**4. 06-01-003B: Cloud seeding and valley fog dispersion pyrotechnic composition for producing local precipitation (modified):** *43.4% aluminum, 34.7% sodium nitrate, 21.7% sulfur, 0.20% moisture and impuriti*es
5. 06-01-004A: Lead smoke improved cloud seeding pyrotechnic composition: *48.9% lead iodate, 37.6% potassium iodate, 7.5% boron, 6% epoxy resin*	**6. 06-01-004B: Lead smoke improved cloud seeding pyrotechnic composition (modified):** *59.6% potassium iodate, 26.2% lead iodate, 6% epoxy resin, 4.7% boron, 3.5% Gilsonite filler*
7. 06-01-005A: Cloud seeding pyrotechnic composition for general use: *61.9% potassium iodate, 27% silver iodate, 6.1% epoxy resin DER 321, 4.8% boron, 0.2% residue*	**8. 06-01-005B: Cloud seeding pyrotechnic composition for general use (modified burn rate):** *53.5% potassium iodate, 23.6% silver iodate, 8.2% Gilsonite, 7.3% epoxy resin DER 321, 7.1% boron, 0.30% residue*
9. 06-01-006A: Cloud seeding pyrotechnic composition: *58.33% silver-I-Iodate, 25% nitrocellulose, 16.66% aluminum grain, 0.01% mixed balance*	**10. 06-01-007A: Cloud seeding pyrotechnic composition for seeding super cooled clouds:** *41.84% plastisol nitrocellulose, 41.42% ammonium nitrate, 16.73% silver-I-Iodate*
11. 06-01-008A: Specialty cloud seeding composition with voluminous burn: *72.92% hexamine/iodate complex salt, 12.08% sulfur, 7.25% lead dioxide, 4.35% red phosphorus, 3.38% silver-I-chloride, 0.02% mixed residual balance*	**12. 06-01-009A: Cloud seeding composition:** *49.27% potassium chlorate, 22.61% silver-I-iodide, 12.11% animal glue, 10.5% sulfur, 5.49% lead nitrate, 0.02% mixed residues*
13. 06-01-009B: Cloud seeding composition: *46.97% potassium iodate, 22.14% silver-I-iodide, 12.08% animal glue, 10.73% sulfur, 8.05% lead-II-acetate, 0.03% balance*	**14. 06-01-010A: Lead smoke improved cloud seeding pyrotechnic composition:** *47.86% silver-I-iodate, 34.18% lead-II-iodate, 10.25% epoxy resin, 7.69% aluminum powder, 0.02% impurities*
15. 06-01-011A: Cloud seeding composition: *40.22% silver-I-iodate, 17.24% sodium nitrate, 13.79% magnesium powder, 10.34% epoxy binder, 9.19% aluminum powder, 9.19% hexachlorobenzene, 0.03% mixed impurities*	**16. 06-01-012A: Cloud seeding composition with bismuth modifier agent:** *41.07% lead-II-iodate, 25% bismuth subnitrate, 15.17% magnesium powder, 12.5% epoxy binder, 6.26% diatomaceous earth, 1% impurities*
17. 06-01-013A: Cloud seeding smoke generating composition: *38.18% lead iodate, 20% silver nitrate, 19.09% phthalic anhydride, 16.36% glycerol, 6.36% polyethylene glycol, 0.01% residual balance*	**18. 06-01-014A: Cloud seeding composition for industrial uses:** *28.9% sodium nitrate, 21.96% lead-II-iodate, 14.45% zinc chloride, 13.87% silver iodide, 10.4% sodium hypophosphite, 10.4% polyurethane, 0.02% mixed residual balance*
19. 06-01-015A: Cloud seeding composition with secondary smoke generation: *25.64% lead-II-iodate, 24.78% zinc powder, 24.78% hexachloroethane, 16.23% silver-I-oxide, 8.54% liquid epoxy resin, 0.03% impurities*	**20. 06-01-016A: Cloud seeding composition with classic "HC" smoke modifier:** *27.29% zinc oxide, 27.29% hexachloroethane, 23.13% silver iodate, 8.67% potassium nitrate, 7.51% epoxy resin, 3.18% powdered aluminum, 2.89% silver-I-chloride, 0.04% mixed balance*
21. 06-01-017A: Cloud seeding composition: *40.65% silver iodate, 24.39% hexachlorobenzene, 15.44% magnesium powder, 8.13% naphthalene, 5.69% PVC polymer, 5.69% silver-I-iodide, 0.01% residual balance*	**22. 06-01-018A: Cloud seeding pyrotechnic composition:** *40.44% lead-II-iodate, 17.64% aluminum powder, 16.91% silver iodate, 13.23% epoxy binder, 11.76% magnesium powder, 0.02% residual balance*
23. 06-01-019A: Cloud seeding composition for the usual purposes: *30.26% silver iodate, 26.31% red phosphorus, 11.84% silver nitrate, 8.55% magnesium powder, 8.55% silver sulfide, 7.23% polyisoprene, 4.6% epoxy resin, 2.63% zinc oxide, 0.03% mixed balance*	**24. 06-01-020A: Cloud seeding composition for military and civil use:** *30.07% potassium iodate, 27.06% hexachlorobenzene, 14.28% cornstarch, 12.03% silver-I-iodide, 9.77% iodine pentoxide, 6.76% phosphorus trisulfide, 0.03% balance*

06-01-001A: Cloud seeding pyrotechnic composition:
Into a wood or cardboard cup, place ***28.8 grams of standard epoxy binder***, followed by ***20.4 grams of magnesium powder*** of 100 mesh, followed by ***42.5 grams of aluminum powder*** of 200 mesh. Thereafter, thoroughly blend the mixture using a stainless steel spatula for about 5 to 10 minutes at room temperature. Afterwards, carefully and gently add in ***284.2 grams of silver iodate***, followed by ***24 grams of hexachlorobenzene***, and then carefully and gently, yet thoroughly blend the entire mixture with the same stainless steel spatula for about 10 to 30 minutes until a uniform homogenous mixture is obtained. To use the mixture, it should be pressed into tubes of at least ½ inch diameter by 6 inch length under a pressure of 3000 psi, in three increments, meaning your tube should be filled in three stages under a pressure of 3000 psi each press. After pressing your tube(s), cure them for 24 hours in an oven at 60 Celsius.

To use, the tubes need to be fired, using a rocket, into a suitable cloud. The recommended dimensions for maximum cloud seeding effect should be ¾ inch in diameter by 12 inches length.
Burn rate: Slow
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: Moderate—may explode under severe shock, but not likely.
Percentage: ***71% silver iodate, 10.6% aluminum, 7.2% standard epoxy binder, 6% hexachlorobenzene, 5.1% magnesium, 0.10% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets.

06-01-002A: Cloud seeding pyrotechnic composition:
Into a suitable blender equipped with plastic stir blade, place ***30 grams of epoxy binder (DER321 standard epoxy)***, followed by 50 milliliters of acetone. Thereafter, quickly blend the mixture for about 5 minutes, and then add in ***90 grams of average aluminum powder***, followed by ***40.6 grams of powdered magnesium***, and then followed by 150 milliliters more of acetone, and then continue to blend for about 30 minutes to form a uniform paste. After 30 minutes, throw in ***218 grams of potassium iodate***, followed by ***120 grams of silver iodate*** and continue blending for about 1 hour on high speed. Note: during the blending operation, some of the acetone will evaporate—never mind this, but maintain a pasty consistency so add more acetone if the mixture becomes difficult to blend. After blending for 1 hour, place the mixture onto a shallow pan, and allow it to thoroughly air dry. When the odor of acetone is gone, place the mixture into a clean ball mill filled with Teflon coated steel shot (about 150 grams) and tumble it for about 1 hour at 200 RPM. Finally, press the tumbled mixture into any desirable delivery container such as a tube made of any desirably material, or mold under high pressure (2000 psi), and then cure the container for about 24 hours at room temperature. To use, the mixture needs to be propelled into the clouds using a rocket, and igniter system for initiation of the cloud seeding composition—the container should be fitted with a parachute to allow proper time for the composition to burn.
Burn rate: Slow.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: Moderate—may explode under severe shock, but not likely.
Percentage: ***43.7% potassium iodate, 24% silver iodate, 18% aluminum, 8.1% magnesium, 6% epoxy binder, 0.2% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets.

06-01-003A: Cloud seeding and valley fog dispersion pyrotechnic composition for producing local precipitation:
Into a suitable mixing bowl or blender, equipped with plastic stir blades, place ***600 grams of powdered aluminum*** of about 20 microns, followed by ***500 grams of anhydrous sodium nitrate*** of 270 mesh, followed by ***350 grams of sodium chloride*** of about 270 mesh, and then add in 250 milliliters of acetone, and then blend the mixture on moderate speed for about 30 minutes to form a uniform paste. After 30 minutes, the mixture should be pressed into a thin walled aluminum tubes under mild pressure, and then cure the munition in a well ventilated oven starting at 60 Celsius for 1 hour, and then heat at 130 Celsius for 1 final hour. After curing, the munitions should be primed with black powder or equivalent, and a corresponding fuse depending on rocket design. The munition needs to be propelled into the clouds using a rocket—the munition should also be fitted with a parachute to allow proper time for the composition to burn. Note: this composition can be used for seeding purposes up to 3 kilometers in the air.
Burn rate: Slow. 30 seconds using a container body 3.5 centimeters in diameter by 25 centimeters in length.
Condensation nuclei: 10^{10}
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.3% aluminum, 34.4% sodium nitrate, 24.1% sodium chloride, 0.20% moisture and impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions.

06-01-003B: Cloud seeding and valley fog dispersion pyrotechnic composition for producing local precipitation (modified):

Into a suitable mixing bowl or blender, equipped with plastic stir blades, place ***500 grams of powdered aluminum*** of about 20 microns, followed by ***400 grams of anhydrous sodium nitrate*** of 270 mesh, followed by ***250 grams of finely divided sulfur*** of about 270 mesh, and then add in 250 milliliters of acetone, and then blend the mixture on moderate speed for about 30 minutes to form a uniform paste. After 30 minutes, the mixture should be pressed into a thin walled aluminum tube under mild pressure, and then cure the munition in a well ventilated oven starting at 60 Celsius for 1 hour, and then heat at 130 Celsius for 1 final hour. After curing, the munitions should be primed with black powder or equivalent, and a corresponding fuse depending on rocket design. The munition needs to be propelled into the clouds using a rocket—the munition should also be fitted with a parachute to allow proper time for the composition to burn.

Burn rate: Similar to 06-01-003A
Condensation nuclei: 10^{10}
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.4% aluminum, 34.7% sodium nitrate, 21.7% sulfur, 0.20% moisture and impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions.

06-01-004A: Lead smoke improved cloud seeding pyrotechnic composition:

Into a suitable mixing bowl or blender, equipped with plastic stir blade, place ***37.5 grams of finely divided boron of standard mesh,*** followed by ***244.5 grams of lead iodate,*** followed by ***188 grams of potassium iodate***, and then add in ***30 grams of standard epoxy resin (DER 321)***, and then blend the mixture on moderate speed for about 10 to 20 minutes to form a uniform paste. Thereafter, the mixture should be pressed into any thin walled aluminum, steel, plastic, or cardboard tube, flare body, container, ect., under mild pressure, and then cure the munition over night. After the curing time, the munition bodies should be primed with a simple black powder or equivalent composition and corresponding fuse (depending on rocket design). The cloud seeding composition and resulting munition body needs to be propelled into the clouds using a rocket—the munition should also be fitted with a parachute to allow proper time for the composition to burn.

Burn rate: Above average—4.3 seconds per inch.
Condensation nuclei: 5.6 x 10^{11} at –6 Celsius per gram.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: Low. May explode under severe conditions.
Percentage: ***48.9% lead iodate, 37.6% potassium iodate, 7.5% boron, 6% epoxy resin***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions.

06-01-004B: Lead smoke improved cloud seeding pyrotechnic composition (modified):

Into a suitable mixing bowl or blender, equipped with plastic stir blade, place ***23.5 grams of finely divided boron of standard mesh,*** followed by ***131 grams of lead iodate,*** followed by ***298 grams of potassium iodate***, followed by ***17.5 grams of Gilsonite***, and then add in ***30 grams of standard epoxy resin (DER 321)***, and then blend the mixture on moderate speed for about 10 to 20 minutes to form a uniform paste. Thereafter, the mixture should be pressed into any thin walled aluminum, steel, plastic, or card board tubes, flare bodies, containers, ect., under mild pressure, and then cure the munition bodies over night. After the curing time, the munition bodies should be primed with a simple black powder or equivalent composition and corresponding fuse (depending on rocket design). The cloud seeding composition and resulting munition body needs to be propelled into the clouds using a rocket—the munition should also be fitted with a parachute to allow proper time for the composition to burn.

Burn rate: Below Average—12 seconds per inch.
Condensation nuclei: 3.5 x 10^{11} at –10 Celsius per gram.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***59.6% potassium iodate, 26.2% lead iodate, 6% epoxy resin, 4.7% boron, 3.5% Gilsonite filler,***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: May be used in commercial cloud seeding rockets and munitions.

06-01-005A: Cloud seeding pyrotechnic composition for general use:

Into a suitable mixing bowl or blender, equipped with plastic stir blade, place ***24 grams of finely divided boron of standard mesh,*** followed by ***132.5 grams of silver iodate,*** followed by ***303.5 grams of potassium iodate***, followed by ***30 grams of standard epoxy resin (DER 321)***, and then followed by 150 milliliters of acetone. Thereafter, blend the mixture on moderate speed for about 10 to 20 minutes to form a uniform paste or mixture. Thereafter, place the mixture into a vacuum desiccator, filled with anhydrous sodium sulfate, and then remove the acetone under vacuum at about 30 Celsius. When all the acetone has been removed, the crumbly mixture left behind is ready for use. To use, it should be pressed into any thin walled aluminum, steel, plastic, or card board tubes, flare bodies, containers, ect., under a pressure of about 2000 psi. The cloud seeding composition should then be primed using an ignition temperature with a flame temperature of at least 350 Celsius. The cloud seeding composition and resulting munition body needs to be propelled into the clouds using a rocket—the munition should also be fitted with a parachute to allow proper time for the composition to burn.

Burn rate: 7 seconds per inch.
Condensation nuclei: 4.1 x 10^{12} at –5 Celsius per gram.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.9% potassium iodate, 27% silver iodate, 6.1% epoxy resin DER 321, 4.8% boron, 0.2% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions.

06-01-005B: Cloud seeding pyrotechnic composition for general use (modified burn rate):

Into a suitable mixing bowl or blender, equipped with plastic stir blade, place ***39 grams of finely divided boron of standard mesh,*** followed by ***129 grams of silver iodate,*** followed by ***292 grams of potassium iodate***, followed by ***45 grams of Gilsonite***, followed by ***40 grams of standard epoxy resin (DER 321)***, and then followed by 150 milliliters of acetone. Thereafter, blend the mixture on moderate speed for about 10 to 20 minutes to form a uniform paste or mixture. Thereafter, place the mixture into a vacuum desiccator, filled with anhydrous sodium sulfate, and then remove the acetone under vacuum at about 30 Celsius. When all the acetone has been removed, the crumbly mixture left behind is ready for use. To use, it should be pressed into any thin walled aluminum, steel, plastic, or card board tubes, flare bodies, containers, ect., under a pressure of about 2000 psi. The cloud seeding composition should then be primed using an ignition temperature with a flame temperature of at least 350 Celsius. The cloud seeding composition and resulting munition body needs to be propelled into the clouds using a rocket—the munition should also be fitted with a parachute to allow proper time for the composition to burn.

Burn rate: 13 seconds per inch.
Condensation nuclei: Similar to 06-01-005A
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***53.5% potassium iodate, 23.6% silver iodate, 8.2% Gilsonite, 7.3% epoxy resin DER 321, 7.1% boron, 0.30% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions.

06-01-006A: Cloud seeding pyrotechnic composition:

Into a suitable vertical mixer, or empty ball mill, place ***300 grams of nitrocellulose***, followed by 300 milliliters of acetone, and then followed by 100 milliliters of 95% ethyl alcohol. Thereafter, rotate the mixture on high RPM for about 15 minutes to form a uniform mix. Thereafter, add in ***200 grams of aluminum powder of coarse grain***, and then add in ***700 grams of silver-I-Iodate***. Thereafter, rotate the mixture on high RPM for about 1 hour at room temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desired flare body, container, tube, ect., under high pressure, and then cured in an oven at ordinary temperature in the usual manner.

Burn rate: Unknown.
Condensation nuclei: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+

Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.33% silver-I-Iodate, 25% nitrocellulose, 16.66% aluminum grain, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions.

06-01-007A: Cloud seeding pyrotechnic composition for seeding super cooled clouds:
Into a large capacity suitable beaker or flask, equipped with motorized stirrer, place 450 grams of nitrocellulose, followed by 6 grams of ethyl centralite, and then followed by 7 liters of nitromethane. Thereafter, blend the mixture for about 30 minutes to form a uniform mixture. Thereafter, add in 96 grams of any desired petroleum sulfonate emulsifying agent, and then followed by 4500 milliliters of water, and then continue to blend the mixture on moderate speed for about 10 minutes. Thereafter, allow the mixture to stand for about 2 hours, whereupon the nitrocellulose should settle to the bottom of the container. Thereafter, filter-off the insoluble nitrocellulose mixture, and then air-dry it using any desired means. Now, place about ***400 grams of this nitrocellulose*** into a suitable mixing drum, equipped with motorized stirrer, and then add in ***396 grams of ammonium nitrate***, and then followed by ***160 grams of silver-I-Iodate***. Thereafter, blend the mixture for about 15 minutes in the usual manner. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desired flare body, container, tube, ect., under high pressure, and then cured in an oven at ordinary temperature in the usual manner.
Burn rate: Unknown.
Condensation nuclei: Average.
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.84% plastisol nitrocellulose, 41.42% ammonium nitrate, 16.73% silver-I-Iodate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions.

06-01-008A: Specialty cloud seeding composition with voluminous burn:
Into a clean beaker, place ***280 grams of hexamine***, and then add in 1400 milliliters of distilled water. Thereafter, blend the entire mixture to dissolve the hexamine. Thereafter, quickly filter the mixture, and then set it aside for a moment. Thereafter, into a separate clean beaker or similar container, place ***474 grams of silver-I-iodate***, and then add in 3000 milliliters of distilled water. Thereafter, blend this mixture to dissolve the strontium nitrate. Thereafter, quickly filter this mixture. Now, place the hexamine solution into an ice bath, and chill to 0 Celsius. Thereafter, slowly add in, in small portions at a time, the nitrate solution while blending the hexamine solution on moderate speed over a period of about 30 to 45 minutes. After the addition, continue to blend the combined mixture on moderate speed for about 30 minutes at 0 Celsius. Thereafter, remove the ice bath, and then pour the entire mixture onto a shallow pan or try, with a high surface area, and then allow the water to fully evaporate until dry solid remains. Thereafter, collect the dried solid that remains behind, and then place it into a clean ball mill, filled with 350 grams of Teflon coated steel shot. Thereafter, add in ***75 grams of lead dioxide***, followed by ***45 grams of red phosphorus***, followed by ***125 grams of flours of sulfur***, and then followed by ***35 grams of silver-I-chloride***, and then tumble the mixture at 200 RPM for about 45 minutes. Thereafter, remove the mixture and separate it from the steel shot in the usual manner. Now, the mixture is ready for use. To use, it simply needs to be moistened with a little ethyl acetate, or ether to form a paste, and then this paste needs to be pressed into any desired flare body, container, tube, ect., under pressure in the usual manner, and the resulting devices then cured in an oven at low temperature until dry and hard.
Burn rate: Unknown.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.92% hexamine/iodate complex salt, 12.08% sulfur, 7.25% lead dioxide, 4.35% red phosphorus, 3.38% silver-I-chloride, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for seeding clouds.

06-01-009A: Cloud seeding composition:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***75 grams of standard animal glue***, followed by 160 milliliters of water, and then followed by ***34 grams of lead nitrate.*** Thereafter, blend the mixture for about 5 minutes to dissolve the

solids. Thereafter, add in 150 milliliters of 95% ethyl alcohol, followed by ***305 grams of potassium chlorate***, followed by ***140 grams of silver-I-iodide***, and then followed by ***65 grams of flours of sulfur***, and then continue to blend the mixture for about 45 minutes. Thereafter, add in about 75 milliliters of acetone, and then continue to blend the mixture for about 5 minutes. Thereafter, place the mixture into a press machine, or equivalent, and then press-out the liquids. Once the wet solid material remains, the mixture is ready for press loading. To do so, the mixture simply needs to be pressed into any desired flare body, tube, container, ect. Under a pressure of about 5,000 psi. The resulting munitions needs to be dried in an oven at 70 to 80 Celsius.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.27% potassium chlorate, 22.61% silver-I-iodide, 12.11% animal glue, 10.5% sulfur, 5.49% lead nitrate, 0.02% mixed residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in rockets for seeding clouds in rain making operations and other moisture condensing operations.

06-01-009B: Cloud seeding composition:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***90 grams of standard animal glue***, followed by 150 milliliters of warm water, and then followed by ***60 grams of lead-II-acetate.*** Thereafter, blend the mixture for about 5 minutes to disperse the solids. Thereafter, add in 100 milliliters of 95% ethyl alcohol, followed by ***350 grams of potassium iodate***, followed by ***165 grams of silver-I-iodide***, and then followed by ***80 grams of flours of sulfur***, and then continue to blend the mixture for about 45 minutes. Thereafter, add in about 90 milliliters of acetone, and then continue to blend the mixture for about 5 minutes. Thereafter, place the mixture into a press machine, or equivalent, and then press-out the liquids. Once the wet solid material remains, the mixture is ready for press loading. To do so, the mixture simply needs to be pressed into any desired flare body, tube, container, ect. Under a pressure of about 5,000 psi. The resulting munitions need to be dried in an oven at 70 to 80 Celsius.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 (estimated).
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.97% potassium iodate, 22.14% silver-I-iodide, 12.08% animal glue, 10.73% sulfur, 8.05% lead-II-acetate, 0.03% balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in rockets for seeding clouds and other moisture condensing operations.

06-01-010A: Lead smoke improved cloud seeding pyrotechnic composition:
Into a suitable mixing bowl, blender, or suitable vertical mixer, place ***45 grams of finely divided aluminum powder of standard mesh***, followed by ***280 grams of silver-I- iodate***, followed by ***200 grams of lead-II-iodate***, and then followed by ***60 grams of standard epoxy resin (DER 321)***, and then blend the mixture on moderate speed for about 10 to 20 minutes to form a uniform paste. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired container, tube, flare body, ect., in the usual manner, and the resulting munitions should then be cured at room temperature, until dry and hard. Prime with any suitable composition.
Burn rate: Typical.
Condensation nuclei: 4.56 x 10^{10} at –16 Celsius per gram (estimated).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47.86% silver-I-iodate, 34.18% lead-II-iodate, 10.25% epoxy resin, 7.69% aluminum powder, 0.02% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets and munitions for the usual means.

06-01-011A: Cloud seeding composition:

Into a suitable empty ball mill, place ***90 grams of standard epoxy binder***, followed by ***120 grams of magnesium powder*** of 100 mesh, followed by ***80 grams of aluminum powder*** of average mesh, followed by ***350 grams of silver-I-iodate***, followed by ***150 grams of sodium nitrate***, and then followed by ***80 grams of hexachlorobenzene***. Thereafter, tumble the mixture at 250 RPM for about 1 hour in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired tube, flare body, container, ect., in the usual manner, and then cured at room temperature in the usual manner. Prime with any suitable smoke ignition composition.
Burn rate: Moderate.
Water resistance: Above moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***40.22% silver-I-iodate, 17.24% sodium nitrate, 13.79% magnesium powder, 10.34% epoxy binder, 9.19% aluminum powder, 9.19% hexachlorobenzene, 0.03% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: May be used in commercial cloud seeding rockets for the usual means.

06-01-012A: Cloud seeding composition with bismuth modifier agent:
Into a suitable empty ball mill, place ***70 grams of DOW epoxy binder*** (70% DER 321 and 30% DEH), followed by ***35 grams of diatomaceous earth,*** followed by ***85 grams of magnesium powder,*** followed by ***140 grams of bismuth subnitrate***, and then followed by ***230 grams of lead-II-iodate.*** Thereafter, tumble the mixture at 250 RPM for 40 minutes in the absence of air. Thereafter, the mixture is ready to use. To use, the mixture simply needs to be pressed into any desirable tube, mold, container flare body, ect., in the usual manner, and then allow the composition to set at room temperature until hard. Prime in the usual manner.
Burn rate: Average.
Smoke volume: High.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.07% lead-II-iodate, 25% bismuth subnitrate, 15.17% magnesium powder, 12.5% epoxy binder, 6.26% diatomaceous earth, 1% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in cloud seeding rockets and flares, for the usual means.

06-01-013A: Cloud seeding smoke generating composition:
Into a suitable mixing bowl, beaker, or similar container, equipped with a motorized stirrer utilizing a plastic stir blade, place ***110 grams of silver nitrate***, followed by ***105 grams phthalic anhydride***, followed by ***90 grams of glycerol***, followed by ***35 grams of polyethylene glycol*** (molecular weight of at least 400), and then followed by ***210 grams of lead iodate***. Thereafter, moderately blend the mixture for about 30 minutes to form a uniform mixture. After the 30 minute mixing period, the mixture is ready to use. To use, it simply needs to be pressed into any desirable flare body, tube, container, ect., and then cure the devices in an oven at 60 Celsius for about 72 hours. Can be ignited readily using a match, or similar composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***38.18% lead iodate, 20% silver nitrate, 19.09% phthalic anhydride, 16.36% glycerol, 6.36% polyethylene glycol, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in commercial and military operations for cloud seeding operations.

06-01-014A: Cloud seeding composition for industrial uses:
Into a standard ball mill, place ***90 grams of polyurethane***, followed by ***125 grams of zinc chloride***, and then followed by ***250 grams of sodium nitrate.*** Thereafter, tumble the mixture at about 150 RPM for about 2 hours. Thereafter, add in ***120 grams of silver-I-iodide***, followed by ***90 grams of sodium hypophosphite,*** and then followed by ***190 grams of lead-II-iodate***. Thereafter, continue to tumble the mixture at 250 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable flare body, tube, container, mold, ect., under a pressure of about 10,000 psi. Thereafter, an ignition composition should be pressed there into, or equivalent..
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***28.9% sodium nitrate, 21.96% lead-II-iodate, 14.45% zinc chloride, 13.87% silver iodide, 10.4% sodium hypophosphite, 10.4% polyurethane, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in rockets for generating a cloud seeding smoke for various operations.

06-01-015A: Cloud seeding composition with secondary smoke generation:
Into a standard mixing bowl or blender equipped with motorized stirrer, place ***95 grams of silver-I-oxide,*** followed by ***145 grams of hexachloroethane***, followed by ***50 grams of any standard liquid epoxy resin***, followed by ***145 grams of standard zinc powder***, and then followed by ***150 grams of lead-II-iodate***. Thereafter, blend the mixture at moderate speed for about 45 minutes in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable container, flare body, mold, fish paper tube, candle, ect., under mild pressure, and the resulting munitions should be cured in an oven at low temperature for several hours (inside a refrigerator), followed by curing at room temperature for about 3 days. Can be ignited using any desired means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***25.64% lead-II-iodate, 24.78% zinc powder, 24.78% hexachloroethane, 16.23% silver-I-oxide, 8.54% liquid epoxy resin, 0.03% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in cloud seeding operations.

06-01-016A: Cloud seeding composition with classic "HC" smoke modifier:
Into a suitable beaker or similar container, equipped with motorized stirrer, place 175 milliliters of diethyl ether, hexane, or acetone, and then add in ***236 grams of freshly calcined zinc oxide*** (can be prepared by roasting finely divided zinc oxide at 900 Celsius for several hours), followed by ***27.5 grams of standard powdered aluminum***, followed by ***236 grams of hexachloroethane***, and then blend the mixture on high until the bulk of the solvent evaporates. Once this point has been reached, place the slightly pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into an empty ball mill, and then add in ***200 grams of silver iodate***, followed by ***75 grams of potassium nitrate***, followed by ***25 grams of silver-I-chloride***, and then followed by ***65 grams of any standard epoxy resin***. Thereafter, tumble the mixture for about 1 hour in the absence of air. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be poured, pressed, and vibrated into any desirable container, candle, flare body, tube, ect., and then allow to cure at room temperature for about 48 hours. Note: heat may or may not used to speed up the curing process.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***27.29% zinc oxide, 27.29% hexachloroethane, 23.13% silver iodate, 8.67% potassium nitrate, 7.51% epoxy resin, 3.18% powdered aluminum, 2.89% silver-I-chloride, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in clouding operations, and in military operations for moisture condensing.

06-01-017A: Cloud seeding composition:
Into a standard mixing bowl or blender, equipped with motorized stirrer, place 175 milliliters of 95% ethyl alcohol, followed by ***35 grams of finely ground PVC polymer,*** followed by ***150 grams of hexachlorobenzene***, followed by ***50 grams of naphthalene,***

followed by ***250 grams of silver iodate***, followed by ***95 grams of standard magnesium powder***, and then followed by ***35 grams of silver-I-iodide***. Thereafter, blend the mixture on high speed for about 50 minutes. Thereafter, place the entire mixture onto a shallow tray or pan, and allow it to thoroughly air-dry. Once it has, place the dried mass into a suitable ball mill filled with Teflon coated steel shot of the usual weight and size, and then ball mill the mixture for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use, so simply press the mixture into any desirable container, flare body, mold, fish paper tube, candle, ect., under high pressure, (10,000 psi). Any suitable ignition composition can be used for proper ignition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.65% silver iodate, 24.39% hexachlorobenzene, 15.44% magnesium powder, 8.13% naphthalene, 5.69% PVC polymer, 5.69% silver-I-iodide, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in cloud seeding munitions for condensation purposes.

06-01-018A: Cloud seeding pyrotechnic composition:
Into a suitable blender equipped with plastic stir blade, place ***90 grams of any epoxy binder*** (such as DER321 standard epoxy), followed by ***120 grams of aluminum powder***, followed by ***80 grams of powdered magnesium***, followed by ***275 grams of lead-II-iodate***, and then followed by ***115 grams of silver iodate.*** Thereafter, blend the mixture on moderate speed for about 1 hour in the absence of air. After the blending operation, the mixture is ready for pressing. To do so, the mixture simply needs to be pressed into any desirable tube, container, mold, flare body, ect., and then allow the munitions to cure at room temperature for about 48 minutes. Prime with any desired ignition composition.
Burn rate: Average (ranges from 0.05 to 0.06 inches per second at –25 Celsius—estimated).
Water resistance: N/A.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***40.44% lead-II-iodate, 17.64% aluminum powder, 16.91% silver iodate, 13.23% epoxy binder, 11.76% magnesium powder, 0.02% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in commercial cloud seeding rockets and similar devices.

06-01-019A: Cloud seeding composition for the usual purposes:
Into a standard mixing bowl, or vertical mixer, equipped with motorized stirrer, place ***35 grams of Epoxy resin (D.E.R. 732)***, followed by ***55 grams of finely ground polyisoprene***, followed by ***20 grams of powdered zinc oxide***, followed by ***65 grams of magnesium powder***, followed by ***200 grams of powdered red phosphorus***, followed by ***230 grams of silver iodate***, followed by ***90 grams of silver nitrate***, and then followed by ***65 grams of silver-I-sulfide***. Thereafter, blend the mixture at moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To do so, the mixture simply needs to be pressed and vibrated into any desirable mold, container, tube, flare body, ect., and then allow the munitions to cure at room temperature for 3 days.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30.26% silver iodate, 26.31% red phosphorus, 11.84% silver nitrate, 8.55% magnesium powder, 8.55% silver sulfide, 7.23% polyisoprene, 4.6% epoxy resin, 2.63% zinc oxide, 0.03%mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in cloud seeding operations for the usual purposes.

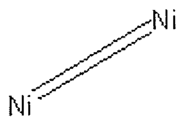
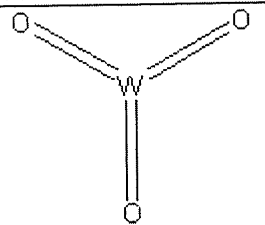
06-01-020A: Cloud seeding composition for military and civil use:
Into a suitable empty ball mill, place ***65 grams of iodine pentoxide (I2O5)***, and then add in 5 milliliters of 10W-30 motor oil, and then tumble the mixture for about 5 minutes to coat the iodine pentoxide. Thereafter, place this iodine pentoxide into a standard mixing bowl, blender, or vertical mixer, equipped with motorized stirrer, and then add in ***180 grams of hexachlorobenzene***, followed by ***45 grams of phosphorus trisulfide***, followed by ***95 grams of corn starch***, followed by ***80 grams of silver-I-iodide***, and then followed by ***200 grams of potassium iodate***, and then dry blend the mixture at moderate speed for about 6 hours at room temperature, in the absence of air and moisture. After 6 hours, add in 15 milliliters of 10W-30 oil, and then continue to blend the mixture for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable container, flare body, tube, ect., in the usual manner under a pressure of 15,000 psi. A suitable ignition composition can then be employed.

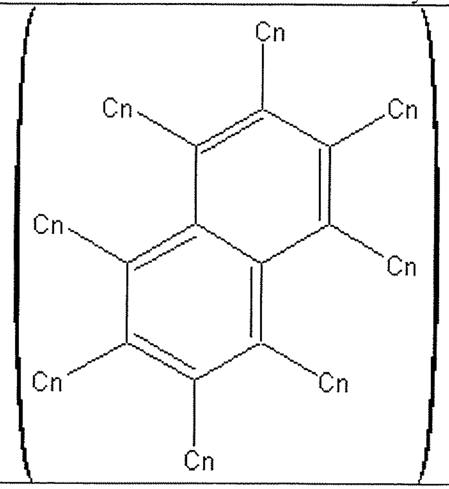
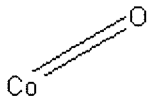
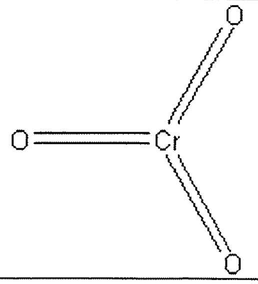
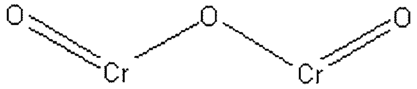
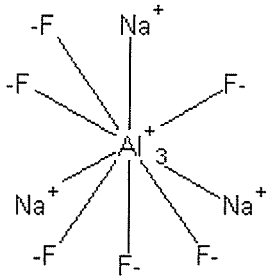
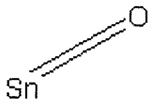
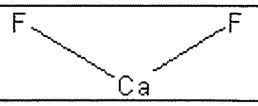
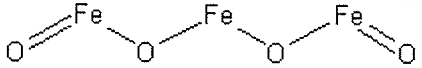
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30.07% potassium iodate, 27.06% hexachlorobenzene, 14.28% cornstarch, 12.03% silver-I-iodide, 9.77% iodine pentoxide, 6.76% phosphorus trisulfide, 0.03% balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in cloud seeding operation and other moisture condensing means.

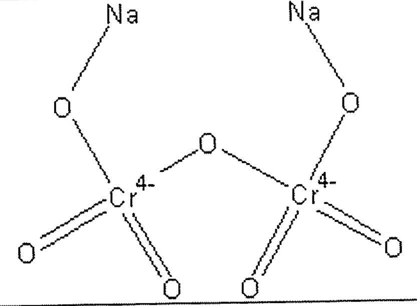
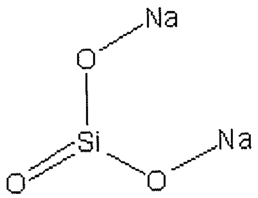
Section 2: Pyrotechnic Solid Welding Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)	**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)	**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)	**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)	**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)	**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)	**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)	**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)	**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)	**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)	**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)	**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)	**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)	**129. Bismuth Subnitrate (see Smoke Generating Compositions)**
130. Calcium Iodate (see Smoke Generating Compositions)	**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)	**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)	**135. Potassium Ferricyanide (see Priming/Igniter Compositions)**
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)	**137. Bismuth Trioxide (see Priming/Igniter Compositions)**
138. Titanium powder (see Priming/Igniter Compositions)	**139. Tungsten powder (see Priming/Igniter Compositions)**
140. Lead Powder (see Priming/Igniter Compositions)	**141. Lead-II-Oxide (red lead; lithrage) (see Priming/Igniter Compositions)**
142. Selenium powder (see Priming/Igniter Compositions)	**143. Sodium Bicarbonate (see Priming/Igniter Compositions)**
144. Iron powder (see Priming/Igniter Compositions)	**145. Silicon Dioxide (see Priming/Igniter Compositions)**
146. Lead Thiocyanate (see Priming/Igniter Compositions)	**147. Para-Nitrotoluene (see Priming/Igniter Compositions)**

148. Silver powder (see Priming/Igniter Compositions)	**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)	**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)	**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)	**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)	**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)	**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate (see Illumination/Flare and Signaling Compositions)	**161. Iodoform (see Illumination/Flare and Signaling Compositions)**
162. Lithium Nitrate (see Illumination/Flare and Signaling Compositions)	**163. Manganese Oxide (see Illumination/Flare and Signaling Compositions)**
164. Sodium Carbonate (see Illumination/Flare and Signaling Compositions)	**165. Molybdenum powder (see Illumination/Flare and Signaling Compositions)**
166. Sodium Oxalate (see Illumination/Flare and Signaling Compositions)	**167. Oxalic Acid (see Illumination/Flare and Signaling Compositions)**
168. Stearic acid (see Illumination/Flare and Signaling Compositions)	**169. Thorium Nitrate (see Illumination/Flare and Signaling Compositions)**
170. Cerium Nitrate (see Illumination/Flare and Signaling Compositions)	**171. Rubidium Nitrate (see Illumination/Flare and Signaling Compositions)**
172. Calcium metal (see Illumination/Flare and Signaling Compositions)	**173. Mercury-II-Chloride (see Illumination/Flare and Signaling Compositions)**
174. Zirconium Carbonate (see Illumination/Flare and Signaling Compositions)	**175. Barium Chloride (see Illumination/Flare and Signaling Compositions)**
176. Antimony powder (see Pyrotechnic Delay Compositions)	**177. Chromium metal (see Pyrotechnic Delay Compositions)**
178. Zinc powder (see Pyrotechnic Delay Compositions)	**179. Tin Dioxide (see Pyrotechnic Delay Compositions)**
180. Silver-I-Chromate (see Pyrotechnic Delay Compositions)	**181. Calcium Chromate (see Pyrotechnic Delay Compositions)**
182. Strontium Chromate (see Pyrotechnic Delay Compositions)	**183. Silver-I-Oxide (see Pyrotechnic Delay Compositions)**
184. Calcium Fluoride (see Pyrotechnic Delay Compositions)	**185. Paraffin (see Incendiary Compositions)**
186. Sodium Peroxide (see Incendiary Compositions)	**187. Metallic Lithium (see Incendiary Compositions)**
188. Calcium Carbide (see Incendiary Compositions)	**189. Ferrocene (see Incendiary Compositions)**
190. Lime (calcium oxide) (see Incendiary Compositions)	**191. Aluminum Oleate (see Incendiary Compositions)**
192. Aluminum Palmitate (see Incendiary Compositions)	**193. Zinc Stearate (see Incendiary Compositions)**
194. Silver Iodate (see Cloud Seeding Compositions)	**195. Silver-Chloride (see Cloud Seeding Compositions)**
196. Lead Acetate (see Cloud Seeding Compositions)	**197. Silver Nitrate (see Cloud Seeding Compositions)**
198. Polyethylene Glycol (see Cloud Seeding Compositions)	**199. Iodine Pentoxide (see Cloud Seeding Compositions)**
200. Nickel powder	**201. Tungsten Oxide**
	
Nickel powder forms a grayish to silvery-grayish solid. The powder burns in air forming the oxide. Nickel powder is insoluble in water and the usual solvents, but is soluble in acids. Keep nickel stored in bottles in a cool dry place.	Forms a yellowish heavy solid, which turns dark orange when heated. The solid is insoluble in water and the usual solvents. The powder dissolves in alkali hydroxide solutions forming tungstates.
202. Graphite	**203. Cobalt Oxide**

	
Graphite forms black to dark brownish black scales or powder. Graphite is a specialized form of crystallized carbon and exists natural. Graphite is the material used in pencils. Graphite is non-flammable, and can withstand extreme temperatures. Graphite is insoluble in water and all known solvents, but is soluble in molten iron.	Forms a dark gray powder, which may be colored olive green to red depending on particle size. The commercial grade usually contains a variety of oxides with no real defined structure. The oxide reacts with oxygen even at room temperature so the solid should be stored in airtight bottles in a cool dry place.
204. Chromium Trioxide	**205. Chromium-III-Oxide**
	
Forms dark red deliquescent crystals, flakes, or powder. The crystals have a melting point of 197 Celsius, and decompose when heated to 250 Celsius. The crystals are readily soluble in water and sulfuric acid. Chromium trioxide is a powerful oxidizing agent so use caution when working with combustible materials.	Forms a light to dark green powder, or crystalline masses. The powder is insoluble in water, alcohol, and all known solvents.
206. Cryolite	**207. Tin Oxide**
 -F Na+ -F F- Al+3 Na+ Na+ -F F- F-	
Forms a beautiful snow-white like mass, or white crystalline granules, or powder. The melting point of cryolite is about 1000 Celsius, where it readily fuses to a fluidized mass. Most cryolite is synthetic and is used to dissolve aluminum oxide in aluminum manufacture. Cryolite is relatively insoluble in water and the usual solvents, but is soluble in sulfuric acid.	Tin oxide forms a brownish-black powder, or brownish crystalline granules or powder. The powder burns when heated forming the dioxide. The powder is insoluble in water but soluble in acids and alkali solutions.
208. Calcium Fluoride	**209. Iron Tetraoxide (Ferrosoferric oxide)**
	
Forms a white crystalline powder or granules. The crystals or powder are insoluble in water and all known solvents, and	Forms the familiar black crystalline solid or powder. Usually exists as a black powder. The powder is fully converted to

only slowly dissolve in mineral acids with the liberation of hydrogen fluoride.	ferric oxide on heating in the air. The powder is insoluble in water and the usual solvents.
210. Sodium dichromate	**211. Sodium Silicate**
 Na Na O O O Cr^{4-} Cr^{4-} O O O O	
Forms a dihydrate, which forms reddish to bright reddish orange crystals, granules, or powder. The powder looses it water of hydration when heating to 100 Celsius. The anhydrous salt has a melting point of 356 Celsius, with decomposition starting at 400 Celsius. The crystals are very soluble in water.	Forms colorless crystals, or white granules or powder. Various modifications exist. Most silicates form hydrates, which make them very soluble in water, with limited solubility in organic solvents.

- Pyrotechnic Solid Welding Compositions in this section -

1. 06-02-001A: Pyrotechnic welding composition 1: *72.7% ferric oxide, 19.1% aluminum, 8% Viton A copolymer, 0.20% residue*	**2. 06-02-002A: Gasless pyrotechnic welding composition for welding aluminum and other metals:** *68.5% nickel, 31.5% aluminum*
3. 06-02-002B: Gasless pyrotechnic welding composition for welding aluminum and other metals (modified): *64.3% nickel, 29.4% aluminum, 5.9% epoxy resin*	**4. 06-02-002C: Gasless pyrotechnic welding composition for welding aluminum and other metals (modified 2):** *39% aluminum, 35.1% nickel, 21.2% magnesium, 4.5% epoxy resin, 0.20% residue*
5. 6-02-003A: Gasless pyrotechnic welding composition for welding iron or steel, and other metals: *41.4% iron oxide, 30.4% nickel, 28% aluminum, 0.20% residue*	**6. 006-02-004A: Pyrotechnic composition for welding copper cables:** *49.1% copper-II-oxide, 33% iron-III-oxide, 12.2% aluminum, 3.7% calcium/silicon alloy, 1.4% iron/manganese alloy, 0.32% residue, 0.28% graphite*
7. 06-02-005A: Pyrotechnic composition for welding copper cables, plates, spokes, pipes, and similar copper bodies: *52.6% copper-II-oxide, 22.5% copper, 17.8% copper/aluminum alloy, 2.4% tungsten, 2.3% calcium silicide, 2.3% fluorspar, 0.10% residue*	**8. 06-02-005B: Pyrotechnic composition for welding copper cables, plates, spokes, pipes, and similar copper bodies (modified):** *51.7% copper oxide, 22.1% copper, 18.3% copper/aluminum alloy, 3.1% tungsten oxide, 2.3% calcium silicide, 2.3% fluorspar, 0.20% residue*
9. 06-02-005C: Pyrotechnic composition for welding copper cables, plates, spokes, pipes, and similar copper bodies (modified 2): *47% copper oxide, 20.1% copper, 20% copper/aluminum alloy, 8.7% cobalt oxide, 2% calcium silicide, 2% fluorspar, 0.20% residue*	**10. 06-02-006A: Pyrotechnic composition for welding iron plates, spokes, pipes, and similar iron bodies with easier ease of ignition:** *43.1% aluminum, 28% sodium nitrate, 10.7% silicon, 6.4% iron, 6.4% epoxy resin, 5.1% silicon dioxide, 0.3% impurities*
11. 06-02-007A: Pyrotechnic composition for welding steel and manganese steels in the form of plates, spokes, pipes, and similar: *71% iron oxide, 12% aluminum, 10% steel powder, 7% ferromanganese*	**12. 06-02-008A: Pyrotechnic composition for welding rail tracks, pipes, and other metals:** *75% iron oxide, 15% magnesium, 10% silicon*
13. 06-02-008B: Pyrotechnic composition for welding rail tracks, pipes, and other metals (modified): *43.8% magnesium/silicon alloy, 43.8% chromium trioxide, 8.3% iron, 3.9% fluorspar, 0.20% residue*	**14. 06-02-009A: Pyrotechnic composition for welding, and forming molten metal for a variety of applications:** *38% silica, 15% aluminum flake, 10% aluminum foil, 10% manganese dioxide, 10% sodium nitrate, 6% cellulosic fibers, 5% cryolite, 5% phenol formaldehyde resin, 1% asbestos fibers*
15. 06-02-010A: Pyrotechnic composition for welding chromium: *27.6% calcium oxide, 19.1% chromium trioxide, 18% chromium metal, 12% chromium-III-oxide, 10.5% iron oxide, 7.3% iron powder, 5% silicon dioxide, 0.46% mixed impurities, 0.04% carbon*	**16. 06-02-011A: Pyrotechnic welding composition for multiple uses:** *25.8% aluminum, 21.5% ion-III-oxide, 16.1% aluminum oxide, 16.1% perlite, 10.7% sodium nitrate, 8% epoxy resin, 1.3% potassium fluroborate, 0.5% impurities*
17. 06-02-012A: Pyrotechnic welding composition for producing molten iron: *75% iron oxide protoxide, 15% magnesium, 10% silicon*	**18. 06-02-012B: Pyrotechnic welding composition for producing molten chromium:** *76% chromium oxide, 12% magnesium, 12% silicon*

19. 06-02-012C: Pyrotechnic welding composition for producing molten copper: *61.8% copper, 12.3% magnesium, 12.3% silicon, 12.3% manganese dioxide, 1% lime, 0.30% mixed residues*	**20. 06-02-012D: Pyrotechnic welding composition for producing molten iron:** *70% iron oxide protoxide, 20% calcium metal, 10% silicon*
21. 06-02-012E: Pyrotechnic welding composition for producing molten iron: *79.2% iron-III-oxide, 20.7% silicon, 0.10% mixed residues*	**22. 06-02-013A: Pyrotechnic welding composition for welding manganese steel, and for repairing manganese steel structures:** *71% iron-III-oxide, 12% aluminum, 10% high carbon steel particles, 7% ferromanganese*
23. 06-02-014A: Pyrotechnic welding composition for welding and cast forming copper: *53.9% copper, 20.4% copper/aluminum alloy, 17.9% copper-II-oxide, 3% silver metal, 2% calcium silicide, 2% fluorspar, 0.65% zinc oxide, 0.15% mixed residues*	**24. 06-02-014B: Pyrotechnic welding composition for welding and cast forming copper with phosphorus burn de-accelerant:** *55% copper, 18.3% copper-II-oxide, 18.4% copper/aluminum alloy, 3.5% phosphorus/copper alloy, 2% calcium silicide, 2% fluorspar, 0.70% zinc oxide, 0.20% mixed residues*
25. 06-02-015A: Pyrotechnic welding composition for welding tin: *56% tin oxide, 39.4% aluminum, 3% calcium fluoride, 1.6% cryolite*	**26. 06-02-015B: Pyrotechnic welding composition for welding tin (with chromium burn decrease):** *61.8% tin oxide, 14.7% aluminum, 13.6% chromium, 9.9% cryolite*
27. 06-02-016A: Pyrotechnic composition for cutting metals and welding: *51.8% iron-III-oxide, 38.1% nickel, 6.5% Teflon, 3.4% aluminum, 0.20% combined balance*	**28. 06-02-016B: Pyrotechnic composition for cutting metals and welding (with improved burn rate):** *33.2% nickel, 27.5% aluminum, 19.6% iron tetraoxide, 19.6% chromium-III-oxide, 0.10% combined balance*
29. 06-02-017A: Pyrotechnic composition for generating molten iron for multiple purposes: *66.8% ferrosilicon (25% iron), 17.9% strontium nitrate, 12.7% ferrosilicon (50% iron), 1.9% sodium nitrate, 0.49% sodium silicate, 0.21% impurities*	**30. 06-02-017B: Pyrotechnic composition for generating molten steel for multiple purposes:** *84.8% ferrosilicon (50% iron), 8% sodium nitrate, 4.2% aluminum, 3% anhydrous sodium carbonate*
31. 06-02-017C: Pyrotechnic composition for generating molten chromium steel for multiple purposes: *86.5% ferrochromium (50 to 75% iron), 7% sodium nitrate, 3.7% aluminum, 2% anhydrous sodium carbonate, 0.8% lime*	**32. 06-02-017D: Pyrotechnic composition for generating molten iron for multiple purposes:** *75% ferrosilicon alloy (50 to 75% iron), 12% sodium dichromate, 8% calcium fluoride, 5% aluminum*
33. 06-02-018A: Pyrotechnic composition for welding copper: *68.49% copper-II-oxide, 27.39% copper/aluminum alloy, 2.73% tin oxide, 1.36% manganese dioxide, 0.03% mixed balance*	**34. 06-02-019A: Pyrotechnic composition for welding copper:** *63.15% copper-II-oxide, 15.78% aluminum powder, 10.52% copper/aluminum alloy, 10.52% red phosphorus, 0.03% residual balance*
35. 06-02-020A: Pyrotechnic composition for welding copper: *68.37% copper-II-oxide, 29.05% copper/aluminum alloy, 1.7% tin oxide, 0.85% manganese dioxide, 0.03% residual balance*	**36. 06-02-020B: Pyrotechnic composition for welding copper:** *89.28% red copper scale, 9.82% aluminum powder, 0.22% tin oxide, 0.22% zinc oxide, 0.22% zirconium aluminum alloy, 0.22% ferro/silicon alloy, 0.02% mixed residual balance*
37. 06-02-021A: Pyrotechnic composition for welding copper and tin: *46.8% tin oxide, 42.2% aluminum powder, 7.3% copper-I-oxide, 3.7% calcium fluoride*	**38. 06-02-021B: Pyrotechnic composition for welding copper and tin:** *52.4% tin oxide, 28.6% aluminum powder, 15% 50/50 aluminum copper alloy, 4% calcium fluoride*
39. 06-02-021C: Pyrotechnic composition for welding silver: *54.8% tin oxide, 19.3% silver, 14.4% aluminum powder, 7.1% copper-I-oxide, 4.4% calcium fluoride*	**40. 06-02-021D: Pyrotechnic composition for welding nickel:** *55.8% tin oxide, 18.2% nickel, 14.3% aluminum powder, 7.1% copper-I-oxide, 4.6% calcium fluoride*
41. 06-02-021E: Pyrotechnic composition for welding Tin: *53.9% tin oxide, 20.4% tin, 14.1% aluminum powder, 7.1% copper-I-oxide, 4.5% calcium fluoride*	

06-02-001A: Pyrotechnic welding composition 1:

Into a suitable beaker or similar container, place 100 milliliters of acetone, followed by ***40 grams of copolymer of vinylidene fluoride and hexafluoropropylene sold under the Trademark of Viton A,*** and then stir the mixture to dissolve all of the copolymer. Note: if the copolymer fails to entirely dissolve, add in a little more acetone, and continue to do so until the copolymer fully dissolves. After the copolymer dissolves, add in ***360 grams of ferric oxide,*** followed by ***95 grams of aluminum powder.*** Thereafter, rapidly blend the entire mixture using, preferable, a motorized stirrer with large plastic blade, on high, for about 2 hours at room temperature. Note: during the mixing operation, some of the acetone will evaporate, so as it does, more acetone should be added in small amounts to maintain a proper consistency of the blended mixture, i.e, the mixture should be in the form of a paste. After blending for 2 hours, place the paste onto a shallow pan and allow it to thoroughly air-dry. When the odor of acetone is gone, place the dried mass into a clean ball mill filled with about 100 grams of Teflon coated steel shot of 10 millimeters of diameter and tumble the mixture for about 1 hour at 150 RPM at room temperature to form a uniform powder. Afterwards, the powder is ready to be used. Note: a magnesium containing igniter composition should be used to ignite this mixture.

Burn rate: Moderate.
Water resistance: Very good—can be used to weld two pieces of iron together even if the pieces are wet.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½
Ease of ignition (1 to 10): 3
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.7% ferric oxide, 19.1% aluminum, 8% Viton A copolymer, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld two pieces of iron together. To do so, the powder should be evenly placed over the edges of the iron pieces to be welded, and the iron pieces should obviously be together side-by-side. The welding powder is then ignited, and during the burn, the heat and molten iron liberated causes the two iron pieces to fuse together.

06-02-002A: Gasless pyrotechnic welding composition for welding aluminum and other metals:
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, place ***342.5 grams of standard powdered nickel***, followed by ***157.5 gram of standard powdered aluminum***, and then add in 400 milliliters of hexane, toluene, or xylene, and then blend the mixture for about 30 minutes on high speed. After 30 minutes, simply filter-off the insoluble mixture, using any form of filtration, and then place the filtered-off mass onto a tray and dry it in an oven at about 70 to 100 Celsius until dry. Once the mixture is dry, it should be placed into a standard ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumbled at 200 RPM for about 30 minutes to form a uniform mixture. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into any desirable shape under high pressure (10,000 psi). Note: for welding aluminum, the mixture should be pressed into pellets of any diameter, or into long bars or strips of 5 millimeters thick by 10 to 25 millimeters in width by any desirable length (depending on what the dimensions of the aluminum pieces to be welded are). Requires high temperature ignition composition for proper ignition (flame temperature of at least 660+ Celsius).
Burn rate: Moderate.
Water resistance: Very good.
Burn temperature: 1700+ Celsius.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 3
Tendency to cake: None.
Explosive ability: None.
Percentage: ***68.5% nickel, 31.5% aluminum***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld two pieces of aluminum together or other metals, even under water. Can also be used to burn through metal containers and the like.

06-02-002B: Gasless pyrotechnic welding composition for welding aluminum and other metals (modified):
Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, place ***342.5 grams of standard powdered nickel***, followed by ***157.5 gram of standard powdered aluminum***, and then add in 400 milliliters of hexane, toluene, or xylene, and then blend the mixture for about 30 minutes on high speed. After 30 minutes, simply filter-off the insoluble mixture, using any form of filtration, and then place the filtered-off mass onto a tray and dry it in an oven at about 70 to 100 Celsius until dry. Once the mixture is dry, it should be placed into a standard ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumbled at 200 RPM for about 30 minutes to form a uniform mixture. Thereafter, place the tumbled mixture into any suitable mixing bowl, container, ect, equipped with motorized stirrer as previous, and then add in ***32 grams of any standard epoxy resin***, and then rapidly blend the mixture for about 10 minutes to form a uniform paste. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into pellets of any diameter, or into bars or "strips" using molds, and then said molds should be cured for several days. Note: the dimension of the molds should be consistent to whatever the dimensions are for the desired metal pieces to be welded. For example, if welding two pieces of aluminum together, and said pieces have dimensions of 5 millimeters thick by 100 millimeters in length, you should shape the welding mixture into bars or "strips" that have similar dimensions. To use, simply place one or more of these bars or strips over the edges, i.e., over the crease (over where the two pieces of metal meet) of the two aluminum pieces to be welded, and then ignite the welding composition using any suitable ignition composition. Requires high temperature ignition composition for proper ignition (flame temperature of at least 660+ Celsius).
Burn rate: Moderate.
Burn temperature: 1700+ Celsius.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 3
Tendency to cake: None.

Explosive ability: None.
Percentage: ***64.3% nickel, 29.4% aluminum, 5.9% epoxy resin***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld two pieces of aluminum together or other metals, even under water. Can also be used to burn through metal containers and the like.

06-02-002C: Gasless pyrotechnic welding composition for welding aluminum and other metals (modified 2):
Into a suitable mixing bowl, blender, ect., equipped with motorizes stirrer utilizing a plastic stir blade, place ***92 grams of standard powdered nickel***, followed by ***102 gram of standard powdered aluminum***, followed by ***55.5 grams of standard powdered magnesium***, and then add in 400 milliliters of hexane, toluene, or xylene, and then blend the mixture for about 30 minutes on high speed. After 30 minutes, simply filter-off the insoluble mixture, using any form of filtration, and then place the filtered-off mass onto a tray and dry it in an oven at about 70 to 100 Celsius until dry. Once the mixture is dry, it should be placed into a standard ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumbled at 200 RPM for about 30 minutes to form a uniform mixture. Thereafter, place the tumbled mixture into any suitable mixing bowl, container, ect, equipped with motorized stirrer as previous, and then add in ***12 grams of any standard epoxy resin***, and then rapidly blend the mixture for about 10 minutes to form a uniform paste. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into pellets of any diameter, or into bars or "strips" using molds, and then said molds should be cured for several days. Note: the dimension of the molds should be consistent to whatever the dimensions are for the desired metal pieces to be welded. For example, if welding two pieces of aluminum together, and said pieces have dimensions of 5 millimeters thick by 100 millimeters in length, you should shape the welding mixture into bars or strips that have similar dimensions. To use, simply place one or more of these bars or strips over the edges, i.e., over the crease (over where the two pieces of metal meet) of the two aluminum pieces to be welded, and then ignite the welding composition using any suitable ignition composition. Requires high temperature ignition composition for proper ignition (flame temperature of at least 660+ Celsius).
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 3 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39% aluminum, 35.1% nickel, 21.2% magnesium, 4.5% epoxy resin, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld two pieces of aluminum together or other metals, even under water. Can also be used to burn through metal containers and the like.

06-02-003A: Gasless pyrotechnic welding composition for welding iron or steel, and other metals:
As in the previous two procedures, into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, place ***152 grams of standard powdered nickel***, followed by ***140 gram of standard powdered aluminum***, followed by ***207 grams of finely divided red iron oxide,*** and then add in 400 milliliters of hexane, toluene, or xylene, and then blend the mixture for about 30 minutes on high speed. After 30 minutes, simply filter-off the insoluble mixture, using any form of filtration, and then place the filtered-off mass onto a tray and dry it in an oven at about 70 to 100 Celsius until dry. Once the mixture is dry, it should be placed into a standard ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumbled at 200 RPM for about 30 minutes to form a uniform mixture. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into pellets of any diameter, or into bars or "strips" under pressure of about 10,000 psi or so. As before, the size of the pellets or strips should be consistent to the dimensions for the desired metal pieces to be welded. For example, if welding two or more pieces of iron or steel together, and said pieces have dimensions of 5 millimeters thick by 100 millimeters in length, you should shape the welding mixture into bars or strips that have similar dimensions. To use, simply place one or more of these bars or strips over the edges, i.e., over the crease (over where the two pieces of metal meet) of the two metal pieces to be welded, and then ignite the welding composition using any suitable ignition composition. Requires high temperature ignition composition for proper ignition (flame temperature of at least 660+ Celsius).
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 3 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.4% iron oxide, 30.4% nickel, 28% aluminum, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used to weld two or more pieces of iron or steel together or other metals, even under water. Can also be used to burn through metal containers and the like.

06-02-004A: Pyrotechnic composition for welding copper cables:

Into a suitable mixing bowl, equipped with motorized stirrer utilizing a sturdy plastic stir blade, place 500 milliliters of hexane, acetone, toluene, or xylene, followed by ***260 grams of copper-II-oxide***, followed by ***175 grams of iron-III-oxide***, and then blend the mixture for about 10 minutes. After 10 minutes, add in ***65 grams of aluminum powder*** of standard available mesh, followed by ***7.5 grams of a finely divided iron/manganese alloy*** containing 55% iron and 45% manganese (commercially available), followed by ***20 grams of a calcium/silicon alloy*** containing 30% calcium and 70% silicon (commercially available), and then followed by ***1.5 grams of finely powdered graphite*** and then continue to blend the mixture on high until the bulk of solvent evaporates. When the bulk of the solvent has evaporated, remove the mixture and place it onto a shallow pan and allow it to thoroughly air-dry. Once the mixture is dried, place it into a clean standard ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture for about 1 hour to thoroughly pulverize it. Thereafter, the mixture is ready to be used. To use, it should be pressed under 5,000 psi pressure into pellets of 5 to 10 millimeters in diameter or so. Requires a significant ignition composition.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.1% copper-II-oxide, 33% iron-III-oxide, 12.2% aluminum, 3.7% calcium/silicon alloy, 1.4% iron/manganese alloy, 0.32% residue, 0.28% graphite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld copper wires, cables, or spokes onto iron or steel bars, cables, rims, sheets, ect. Can be used under water and during wet and snowy conditions.

06-02-005A: Pyrotechnic composition for welding copper cables, plates, spokes, pipes, and similar copper bodies:

First, into a suitable crucible or similar container, place ***375 grams of copper scale*** (tiny copper chips or flakes), and then roast the copper scale at 600 to 800 Celsius for several hours. Thereafter, place this roasted copper scale, after it has cooled, into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the roasted copper scale at 300 RPM for several hours to form a uniform pulverized mass. Thereafter, shake the roasted copper scale through a mesh screen of 150 to 350 mesh to separate it from any larger pieces. Now, place this pulverized copper scale into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter, followed by ***89 grams of finely divided copper/aluminum alloy*** containing 30% copper and 70% aluminum (commercially available) followed by ***11.5 grams of calcium silicide***, and then followed by 150 milliliters of acetone, and then tumble the mixture at 250 RPM for about 30 minutes. After 30 minutes, throw in ***11.5 grams of finely ground fluorspar***, followed by ***12 grams of finely divided standard powdered tungsten***, and then 50 milliliters of additional acetone, and then continue to tumble the mixture at 250 RPM until the bulk of the acetone evaporates. When the bulk of the acetone has evaporated, the mixture is ready to use. To use, the acetone damp mixture should be pressed into pellets, sheets, rods, or bars of any desirable shape and size, and then cured in an oven at 40 to 50 Celsius until thoroughly dry. Requires a significant ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.6% copper-II-oxide, 22.5% copper, 17.8% copper/aluminum alloy, 2.4% tungsten, 2.3% calcium silicide, 2.3% fluorspar, 0.10% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld copper wires, cables, spokes, plates, rods, and many other copper bodies to other copper bodies or onto iron or steel bars, cables, rims, sheets, ect. Can be used under water and during wet and snowy conditions.

06-02-005B: Pyrotechnic composition for welding copper cables, plates, spokes, pipes, and similar copper bodies (modified):

First, into a suitable crucible or similar container, place ***369.5 grams of copper scale*** (tiny copper chips or flakes), and then roast the copper scale at 600 to 800 Celsius for several hours. Thereafter, place this roasted copper scale, after it has cooled, into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the roasted copper scale at 300 RPM for several hours to form a uniform pulverized mass. Thereafter, shake the roasted copper scale through a mesh screen of 150 to 350 mesh to separate it from any larger pieces. Thereafter, shake the roasted copper scale through a mesh screen of 150 to 350 mesh to separate it form any larger pieces. Now, place this roasted pulverized copper scale into a suitable mixing bowl or suitable container, equipped with motorized stirrer equipped with plastic stir blade, and then add in 350 milliliters of acetone, followed by ***91.5 grams of finely divided copper/aluminum alloy*** containing 30% copper and 70% aluminum (commercially available) followed by ***11.5 grams of calcium silicide***, followed by ***11.5 grams of finely ground fluorspar***, followed by ***15.5 grams of finely divided tungsten oxide (WO3)***, and then blend the mixture on high speed until the bulk of the acetone evaporates. When the bulk of the acetone has evaporated, the mixture is ready to use. To use, the acetone damp mixture should be pressed into pellets, sheets, rods, or bars of any desirable shape and size, and then cured in an oven at 40 to 50 Celsius until thoroughly dry. Requires a significant ignition composition.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***51.7% copper oxide, 22.1% copper, 18.3% copper/aluminum alloy, 3.1% tungsten oxide, 2.3% calcium silicide, 2.3% fluorspar, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld copper wires, cables, spokes, plates, rods, and many other copper bodies to other copper bodies or onto iron or steel bars, cables, rims, sheets, ect. Can be used under water and during wet and snowy conditions.

06-02-005C: Pyrotechnic composition for welding copper cables, plates, spokes, pipes, and similar copper bodies (modified 2):

As in the previous preparation, first, into a suitable crucible or similar container, place ***335 grams of copper scale*** (tiny copper chips or flakes), and then roast the copper scale at 600 to 800 Celsius for several hours. Thereafter, place this roasted copper scale, after it has cooled, into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the roasted copper scale at 300 RPM for several hours to form a uniform pulverized mass. Thereafter, shake the roasted copper scale through a mesh screen of 150 to 350 mesh to separate it from any larger pieces. Thereafter, shake the roasted copper scale through a mesh screen of 150 to 350 mesh to separate it form any larger pieces. Now, place this roasted pulverized copper scale into a suitable mixing bowl or suitable container, equipped with motorized stirrer equipped with plastic stir blade, and then add in 350 milliliters of acetone, followed by ***100 grams of finely divided copper/aluminum alloy*** containing 30% copper and 70% aluminum (commercially available) followed by ***10 grams of calcium silicide***, followed by ***10 grams of finely ground fluorspar***, followed by ***43.5 grams of finely divided cobalt oxide (Co3O4)***, and then blend the mixture on high speed until the bulk of the acetone evaporates. When the bulk of the acetone has evaporated, the mixture is ready to use. To use, the acetone damp mixture should be pressed into pellets, sheets, rods, or bars of any desirable shape and size, and then cured in an oven at 40 to 50 Celsius until thoroughly dry. Requires a significant ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47% copper oxide, 20.1% copper, 20% copper/aluminum alloy, 8.7% cobalt oxide, 2% calcium silicide, 2% fluorspar, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld copper wires, cables, spokes, plates, rods, and many other copper bodies to other copper bodies or onto iron or steel bars, cables, rims, sheets, ect. Can be used under water and during wet and snowy conditions.

06-02-006A: Pyrotechnic composition for welding iron plates, spokes, pipes, and similar iron bodies with easier ease of ignition:

Into a suitable mixing bowl or suitable container, equipped with motorized stirrer equipped with plastic stir blade, place 300 milliliters of hexane, followed by ***100 grams of standard powdered aluminum***, followed by ***15 grams of standard iron powder***, followed by ***25 grams of finely ground silicon***, followed by ***15 grams of any standard epoxy resin***, and then blend the mixture on high speed for about 10 minutes. After 10 minutes, add in ***65 grams of sodium nitrate***, followed by ***12 grams of powdered silicon dioxide***, and then continue to blend the mixture until the bulk of the hexane evaporates, and a semi-fluidized, almost casted mass remains. Immediately thereafter, cast the mixture into pellets, rods, sheets, ect., of any desirable size and shape, and then cure the casted pieces for a day or so. Requires a proper ignition composition, but much less then that as for previous welding compositions. To weld, your pieces of metal should touch each other, in the usual fashion, and the casted cured pyrotechnic welding compositions placed there above, and ignited. The ignition liberates molten iron which will heat and fuse the pieces of metal together.
Burn rate: Average.

Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.1% aluminum, 28% sodium nitrate, 10.7% silicon, 6.4% iron, 6.4% epoxy resin, 5.1% silicon dioxide, 0.3% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld iron pieces together. Can be used under water and during wet and snowy conditions.

06-02-007A: Pyrotechnic composition for welding steel and manganese steels in the form of plates, spokes, pipes, and similar:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***60 grams of standard powdered aluminum***, followed by ***355 gram of finely divided red iron-III-oxide***, followed by ***50 grams of finely divided high carbon steel powder***, followed by ***35 grams of finely divided ferromanganese powder***, and then followed by 150 milliliters of acetone. Thereafter, tumble the mixture at about 300 RPM until the bulk of the acetone evaporates. Thereafter, the mixture is ready to be used. To use, it simply needs to be pressed into any desirable pellets, discs, sheets, rods, ect., depending on what particular operation you have in mind. The pressed mixture then needs to be cured for a day or so to allow for proper drying. Requires magnesium ignition composition for proper burn.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***71% iron oxide, 12% aluminum, 10% steel powder, 7% ferromanganese***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld steel and manganese steel pieces together. Can be used under water and during wet and snowy conditions.

06-02-008A: Pyrotechnic composition for welding rail tracks, pipes, and other metals:
Into a suitable mixing bowl or suitable container, equipped with motorized stirrer equipped with plastic stir blade, place 350 milliliters of hexane, followed by ***75 grams of standard powdered magnesium,*** followed by ***50 grams of standard silicon powder,*** followed by ***375 grams of finely ground red iron-III-oxide***, and then blend the mixture on high speed until the bulk of the hexane evaporates, and a pasty mass remains. Thereafter, the mixture should be pressed into pellets, rods, sheets, ect., of any desirable size and shape, under mild pressure, and then allowed to cure for a day or so. Requires a proper ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% iron oxide, 15% magnesium, 10% silicon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld iron or steel rail tracks, pipes, and similar objects. Can be used under water and during wet and snowy conditions.

06-02-008B: Pyrotechnic composition for welding rail tracks, pipes, and other metals (modified):
Into a suitable mixing bowl or suitable container, equipped with motorized stirrer equipped with plastic stir blade, place 350 milliliters of hexane, followed by ***200 grams of a finely powdered magnesium/silicon alloy*** containing 50% magnesium and 50% silicon by weight, followed by ***200 grams of chromium trioxide,*** followed by ***18 grams of finely ground fluorspar***, and then followed by ***38 grams of standard powdered iron***, and then blend the mixture on high speed until the bulk of the hexane evaporates, and a pasty mass remains. Thereafter, the mixture should be pressed into pellets, rods, sheets, ect., of any desirable size and shape, under mild pressure, and then allowed to cure for a day or so. Requires a proper ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ½

Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.8% magnesium/silicon alloy, 43.8% chromium trioxide, 8.3% iron, 3.9% fluorspar, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld iron or steel rail tracks, pipes, and similar objects. Can be used under water and during wet and snowy conditions.

06-02-009A: Pyrotechnic composition for welding, and forming molten metal for a variety of applications:
Into a suitable mixing bowl or suitable container, equipped with motorized stirrer equipped with plastic stir blade, place 400 milliliters of water, followed by ***75 grams of aluminum flake,*** followed by ***50 grams of pulverized aluminum foil,*** followed by ***50 grams of finely ground manganese dioxide***, followed by ***50 grams of sodium nitrate,*** followed by ***25 grams of finely ground cryolite,*** and then boil the mixture at 100 Celsius for about 15 minutes while rapidly blending the mixture. Thereafter, while continuing to blend the mixture at 100 Celsius, add in ***30 grams of finely ground cellulosic fibers*** (commercially available), followed by ***5 grams of standard asbestos fibers***, followed by ***190 grams of finely ground silica***, and finally followed by ***25 grams of a phenol formaldehyde novalak resin*** of 300 mesh (commercially available), and then continue to boil the mixture with rapid stirring for about 15 minutes. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, add in 250 milliliters of ethyl acetate, and then blend the mixture on moderate speed for about 5 minutes. Finally, filter-off the insoluble mass, using either style of filtration, and then place the collected filtered-off mass onto a shallow tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with the usual diameter of Teflon coated steel shot and weight, and then tumble the mixture at 100 RPM for about 30 minutes. Thereafter, the mixture is ready to use. To use, it simply needs to be pressed into any desirable pellets, discs, rods, ect., under a pressure of 5000 psi for use in welding purpose, or it can be pressed into any desirable container, tube, body, mold, ect., under a pressure of 5000 psi in the usual manner. Requires a proper ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***38% silica, 15% aluminum flake, 10% aluminum foil, 10% manganese dioxide, 10% sodium nitrate, 6% cellulosic fibers, 5% cryolite, 5% phenol formaldehyde resin, 1% asbestos fibers***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld iron or steel for various applications, for generating molten metal for casting purposes, heat-treating welding surfaces, and for incendiary operations. Can be used under water and during wet and snowy conditions.

06-02-010A: Pyrotechnic composition for welding chromium:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***115 grams of chromium metal powder*** of average mesh, followed by ***47 grams of standard iron powder***, followed by ***77 grams of chromium-III-oxide*** (Cr_2O_3), followed by ***122 grams of chromium trioxide*** (CrO_3), followed by ***67.5 grams of finely divided red iron-III-oxide***, followed by ***32.5 grams of silicon dioxide***, followed by ***176 grams of pulverized calcium oxide***, and then followed by ***300 milligrams of finely divided carbon***, and then tumble the mixture at 150 RPM for about 2 hours. Thereafter, the uniform mixture is ready for use. To use, it simply needs to be pressed into any desirable pellets, discs, rods, ect., under a pressure of 10,000 psi for use in welding purposes in the usual manner. Requires a proper ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***27.6% calcium oxide, 19.1% chromium trioxide, 18% chromium metal, 12% chromium-III-oxide, 10.5% iron oxide, 7.3% iron powder, 5% silicon dioxide, 0.46% mixed impurities, 0.04% carbon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for generating molten chromium for use in welding purposes.

06-02-011A: Pyrotechnic welding composition for multiple uses:
Into a suitable mixing bowl, equipped with motorized stirrer, place 250 milliliters of ether or hexane and then add in ***240 grams of finely powdered aluminum*** of standard mesh, followed by ***150 grams of aluminum oxide***, followed by ***150 grams of "perlite"***, which is a siliceous volcanic rock mineral, followed by ***100 grams of dry sodium nitrate***, followed by ***200 grams of red iron-III-oxide***, and then followed by ***12.5 grams of potassium fluoroborate***, and then blend the mixture on moderate speed until the bulk of the solvent

evaporates. Thereafter, add in ***75 grams of standard epoxy resin***, such as Epon 815 or equivalent, and then continue to blend the mixture for about 10 minutes. After 10 minutes, the mixture is ready to be molded. To do so, the mixture should be pressed into any desirable pellets, disc, rods, or any other desirable shape and size depending on your specific applications, and then allowed to cure for a day or so. Note: curing in an oven at moderate temperature may or may not be used to increase the curing time. Requires a proper ignition composition (300+ Celsius).
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***25.8% aluminum, 21.5% ion-III-oxide, 16.1% aluminum oxide, 16.1% perlite, 10.7% sodium nitrate, 8% epoxy resin, 1.3% potassium fluoroborate, 0.5% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for generating molten iron for welding purposes, mold forming, ingot casting, and for other applications utilizing molten iron.

06-02-012A: Pyrotechnic welding composition for producing molten iron:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter or so, place ***75 grams of finely powdered magnesium***, followed by ***50 grams of finely divided silicon***, followed by ***375 grams of iron oxide protoxide (Fe3O4)***, and then tumble the mixture at 150 RPM for about 1 hour. After 1 hour, the mixture is ready to be used. To use, the mixture can be used as a loose powder, or can be pressed into pellets, tablets, discs, or rods of any desirable size, ect., under a pressure of about 8000 psi. Should be ignited using a high temperature ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% iron oxide protoxide, 15% magnesium, 10% silicon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for generating molten iron for welding purposes, mold forming, ingot casting, and for other applications utilizing molten iron.

06-02-012B: Pyrotechnic welding composition for producing molten chromium:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter or so, place ***60 grams of finely powdered magnesium***, followed by ***60 grams of finely divided silicon***, followed by ***380 grams of chromium-III-oxide (Cr2O3)***, and then tumble the mixture at 150 RPM for about 1 hour. After 1 hour, the mixture is ready to be used. To use, the mixture can be used as a loose powder, or can be pressed into pellets, tablets, discs, or rods of any desirable size, ect., under a pressure of about 8000 psi. Should be ignited using a high temperature ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***76% chromium oxide, 12% magnesium, 12% silicon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to form molten chromium for making chromium alloys, welding purposes, mold forming, and for various other purposes.

06-02-012C: Pyrotechnic welding composition for producing molten copper:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter or so, place ***60 grams of finely powdered magnesium***, followed by ***60 grams of finely divided silicon***, followed by ***60 grams of manganese dioxide***, followed by ***300 grams of finely granulated copper,*** followed by ***5 grams of finely powdered lime,*** and then tumble the mixture at 150 RPM for about 1 hour. After 1 hour, the mixture is ready to be used. To use, the mixture can be used as a loose powder, or can be pressed into pellets, tablets, discs, or rods of any desirable size, ect., under a pressure of about 8000 psi. Should be ignited using a high temperature ignition composition.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.8% copper, 12.3% magnesium, 12.3% silicon, 12.3% manganese dioxide, 1% lime, 0.30% mixed residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to form molten copper for making manganese/copper alloys, welding purposes, mold forming, and for various purposes.

06-02-012D: Pyrotechnic welding composition for producing molten iron:
Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer, place 150 milliliters of diethyl ether or hexane, followed by ***100 grams of finely granulated calcium metal***, followed by ***50 grams of finely divided silicon***, and then followed by ***350 grams of iron oxide protoxide (Fe3O4)***, and then blend the mixture on moderate speed until the bulk of the of solvent evaporates. Thereafter, place the semi-pasty mass into a clean heated ball mill filled with Teflon coated steel shot of the usual weight and diameter, and then tumble the mixture at 200 RPM for about 1 hour at about 50 Celsius to form a uniform dry powder. After 1 hour, the mixture is ready for use. The mixture can be used as a loose powder, or can be pressed into pellets, tablets, discs, or rods of any desirable size, ect., under a pressure of about 8000 psi. Should be ignited using a high temperature ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% iron oxide protoxide, 20% calcium metal, 10% silicon***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to form molten iron for making iron alloys, welding purposes, mold forming, and for various purposes.

06-02-012E: Pyrotechnic welding composition for producing molten iron:
Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer, place 150 milliliters of diethyl ether or hexane, followed by ***100.8 grams of finely divided silicon***, and then followed by ***384 grams of finely divided red iron-III-oxide***, and then blend the mixture on moderate speed until the bulk of the of solvent evaporates. Thereafter, place the semi-pasty mass into a clean heated ball mill filled with Teflon coated steel shot of the usual weight and diameter, and then tumble the mixture at 200 RPM for about 1 hour at about 50 Celsius to form a uniform dry powder. After 1 hour, the mixture is ready for use. The mixture can be used as a loose powder, or can be pressed into pellets, tablets, discs, or rods of any desirable size, ect., under a pressure of about 8000 psi. Should be ignited using a high temperature ignition composition, but should ignite readily using standard ignition compositions.
Burn rate: Average. Produces excessive amounts of heat 1800+ Celsius
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***79.2% iron-III-oxide, 20.7% silicon, 0.10% mixed residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used to form copious amounts of molten iron for making iron alloys, welding purposes, mold forming, and for various applications.

06-02-013A: Pyrotechnic welding composition for welding manganese steel, and for repairing manganese steel structures:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***60 grams of granulated aluminum*** of 20 to 30 mesh, followed by ***355 grams of red iron-III-oxide***, followed by ***50 grams of high carbon steel scale or particles***, followed by ***35 grams of pulverized of ferromanganese*** of 10 mesh, and then tumble the mixture at 300 RPM for about 2 hours to form a uniform mixture. Thereafter, the finely tumbled mixture is ready for use. The composition can be used as a loose powder, or it can be pressed into any desirable pellets, tablets, rods, ect., ect., under a pressure of about 6000 psi. It can be ignited using any suitable means, but may not ignite properly utilizing an electric squib.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 7 ¼
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***71% iron-III-oxide, 12% aluminum, 10% high carbon steel particles, 7% ferromanganese***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld manganese steel, and to fix or repair manganese steel structures, containers, ect.

06-02-014A: Pyrotechnic welding composition for welding and cast forming copper:

Into a suitable crucible or similar container, place ***143.6 grams of copper scale*** composed of copper chips ranging from 1 to 5 milliliters in length, and then roast this scale at 400 to 500 Celsius for about 1 hour. Thereafter, remove the heat source, and allow the roasted scale to cool to room temperature. Thereafter, into an empty ball mill, place the roasted copper scale, followed by ***40.8 grams of a copper/aluminum alloy***, composed of 57% copper and 43% aluminum (commercially available), followed by ***4 grams of calcium silicide***, followed by ***4 grams of fluorspar***, followed by ***1.3 grams of zinc oxide***, and then followed by ***6 grams of finely divided silver*** metal. Thereafter, tumble the mixture for about 1 hour at room temperature. Thereafter, the mixture is ready for use. To use, it can be pressed into any desirable form under a pressure of about 8000 psi, or it can be used as a loose material. It can also be placed into a carbon crucible, and then ignited and the molten metal then poured and/or casted. Requires proper ignition composition, such as a magnesium starter mixture.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***53.9% copper, 20.4% copper/aluminum alloy, 17.9% copper-II-oxide, 3% silver metal, 2% calcium silicide, 2% fluorspar, 0.65% zinc oxide, 0.15% mixed residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld copper in various operations, or for casting copper.

06-02-014B: Pyrotechnic welding composition for welding and cast forming copper with phosphorus burn de-accelerant:

Into a suitable crucible or similar container, place ***146.6 grams of copper scale*** composed of copper chips ranging from 1 to 5 milliliters in length, and then roast this scale at 400 to 500 Celsius for about 1 hour. Thereafter, remove the heat source, and allow the roasted scale to cool to room temperature. Thereafter, into an empty ball mill, place the roasted copper scale, followed by ***36.6 grams of a copper/aluminum alloy***, composed of 50% copper and 50% aluminum (commercially available), followed by ***4 grams of calcium silicide***, followed by ***4 grams of fluorspar***, followed by ***1.4 grams of zinc oxide***, and then followed by ***7 grams of a phosphorus/copper alloy*** containing 85% copper and 15% black phosphorus. Thereafter, tumble the mixture for about 1 hour at room temperature. Thereafter, the mixture is ready for use. To use, it can be pressed into any desirable form under a pressure of about 8000 psi, or it can be used as a loose material. It can also be placed into a carbon crucible, and then ignited and the molten metal then poured and/or casted. Requires proper ignition composition, such as a magnesium starter mixture.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55% copper, 18.3% copper-II-oxide, 18.4% copper/aluminum alloy, 3.5% phosphorus/copper alloy, 2% calcium silicide, 2% fluorspar, 0.70% zinc oxide, 0.20% mixed residues***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld copper in various operations, or for casting copper.

06-02-015A: Pyrotechnic welding composition for welding tin:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter, place ***280 grams of tin oxide***, followed by ***197 grams of finely powdered aluminum*** of average mesh, followed by ***15 grams of calcium fluoride***, and then followed by ***8 grams of cryolite***, and then tumble the mixture for about 1 hour at 100 RPM for about 1 hour. After 1 hour, the mixture is ready for use. To use, the mixture can be used as a loose powder, or it can be pressed into pellets, plates, discs, rods, cubes, ect., under a pressure of about 15,000 psi. Requires proper ignition compositions for proper burn.
Burn rate: Moderate.
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***56% tin oxide, 39.4% aluminum, 3% calcium fluoride, 1.6% cryolite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld tin and tin alloys, or for casting purposes.

06-02-015B: Pyrotechnic welding composition for welding tin (with chromium burn decrease):

Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter, place ***309 grams of tin oxide***, followed by ***73.5 grams of finely powdered aluminum*** of average mesh, followed by ***49.5 grams of calcium fluoride***, and then followed by ***68 grams of finely powdered chromium***, and then tumble the mixture for about 1 hour at 100 RPM for about 1 hour. After 1 hour, the mixture is ready for use. To use, the mixture can be used as a loose powder, or it can be pressed into pellets, plates, discs, rods, cubs, ect., under a pressure of about 15,000 psi. Requires proper ignition compositions for proper burn.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.8% tin oxide, 14.7% aluminum, 13.6% chromium, 9.9% cryolite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to weld tin and tin alloys, or for casting purposes.

06-02-016A: Pyrotechnic composition for cutting metals and welding:

Into a suitable blender equipped with plastic stir blade, place 150 milliliters of acetone, followed by ***145 grams of finely divided nickel powder,*** followed by ***13 grams of finely powdered aluminum,*** of average mesh, followed by ***197 grams of finely divided red iron-III-oxide,*** and then followed by ***25 grams of powdered Teflon.*** Thereafter, rapidly blend the mixture until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, as in many examples, place the dried mass into a ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform mixture. Afterwards, the mixture is ready for use. To use, it should be pressed into tablets, or pellets of any desirable size under a pressure of 30,000 psi, for cutting and breeching purposes. For welding, the powder can be used in loose powder form. Should be initiated using a magnesium containing ignition composition.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***51.8% iron-III-oxide, 38.1% nickel, 6.5% Teflon, 3.4% aluminum, 0.20% combined balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to breech and cut steel, and for welding purposes. Can also be used as an incendiary agent.

06-02-016B: Pyrotechnic composition for cutting metals and welding (with improved burn rate):

Into a suitable blender equipped with plastic stir blade, place 150 milliliters of acetone, followed by ***149.5 grams of finely divided nickel powder,*** followed by ***124 grams of finely powdered aluminum,*** of average mesh, followed by ***88.3 grams of iron tetraoxide (Fe3O4),*** and then followed by ***88.3 grams of chromium-III-oxide (Cr2O3).*** Thereafter, rapidly blend the mixture until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, as in many examples, place the dried mass into a ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform mixture. Afterwards, the mixture is ready for use. To use, it should be pressed into tablets, or pellets of any desirable size under a pressure of 30,000 psi, for cutting and breeching purposes. For welding, the powder can be used in loose powder form. Should be initiated using a magnesium containing ignition composition.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6

Tendency to cake: None.
Explosive ability: None.
Percentage: *33.2% nickel, 27.5% aluminum, 19.6% iron tetraoxide, 19.6% chromium-III-oxide, 0.10% combined balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to breech and cut steel, and for welding purposes. Can also be used as an incendiary agent.

06-02-017A: Pyrotechnic composition for generating molten iron for multiple purposes:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***420 grams of finely powdered ferrosilicon*** (containing 75% silicon and 25% iron), followed by ***80 grams of finely powdered ferrosilicon*** (containing 50% iron and 50% silicon), followed by ***112.5 grams of strontium nitrate***, followed by ***12.5 grams of sodium nitrate***, and then followed by ***3.1 grams of sodium silicate,*** and then tumble the mixture for about 1 hour at 150 RPM. After 1 hour, the mixture is ready for use. To use, the mixture can be used as a loose powder, or it can be pressed into pellets, plates, discs, rods, cubes, ect., under a pressure of about 15,000 psi. Requires proper ignition composition for proper burn.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: *66.8% ferrosilicon (25% iron), 17.9% strontium nitrate, 12.7% ferrosilicon (50% iron), 1.9% sodium nitrate, 0.49% sodium silicate, 0.21% impurities*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten iron for welding, cast forming, and for forming iron alloys.

06-02-017B: Pyrotechnic composition for generating molten steel for multiple purposes:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***424 grams of finely powdered ferrosilicon*** (containing 50% silicon and 50% iron), followed by ***21 grams of powdered aluminum of average mesh***, followed by ***40 grams of sodium nitrate***, and then followed by ***15 grams of anhydrous sodium carbonate,*** and then tumble the mixture for about 1 hour at 150 RPM. After 1 hour, the mixture is ready for use. To use, the mixture can be used as a loose powder, or it can be pressed into pellets, plates, discs, rods, cubes, ect., under a pressure of about 15,000 psi. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: *84.8% ferrosilicon (50% iron), 8% sodium nitrate, 4.2% aluminum, 3% anhydrous sodium carbonate*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten steel for welding, cast forming, and for forming alloys.

06-02-017C: Pyrotechnic composition for generating molten chromium steel for multiple purposes:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***432.5 grams of finely powdered high carbon ferrochromium*** (containing 50% to 75% iron, 50% to 75% chromium, and 1% to 5% carbon, commercially available), followed by ***18.5 grams of powdered aluminum of average mesh***, followed by ***35 grams of sodium nitrate***, followed by ***4 grams of powdered lime,*** and then followed by ***10 grams of anhydrous sodium carbonate,*** and then tumble the mixture for about 1 hour at 150 RPM. After 1 hour, the mixture is ready for use. To use, the mixture can be used as a loose powder, or it can be pressed into pellets, plates, discs, rods, cubes, ect., under a pressure of about 15,000 psi. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: *86.5% ferrochromium (50 to 75% iron), 7% sodium nitrate, 3.7% aluminum, 2% anhydrous sodium carbonate, 0.8% lime*

Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten chromium steel for welding, cast forming, and for forming alloys.

06-02-017D: Pyrotechnic composition for generating molten iron for multiple purposes:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***375 grams of finely powdered high carbon ferrosilicon*** (containing 50% to 75% silicon, 50% to 75% iron, and 1% to 5% carbon, commercially available), followed by ***25 grams of powdered aluminum of average mesh***, followed by ***40 grams of calcium fluoride***, and then followed by ***60 grams of sodium dichromate,*** and then tumble the mixture for about 1 hour at 150 to 200 RPM. After 1 hour, the mixture is ready for use. To use, the mixture can be used as a loose powder, or it can be pressed into pellets, plates, discs, rods, cubes, ect., under a pressure of about 15,000 psi. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: *75% ferrosilicon alloy (50 to 75% iron), 12% sodium dichromate, 8% calcium fluoride, 5% aluminum*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten steel for welding, cast forming, and for forming alloys.

06-02-018A: Pyrotechnic composition for welding copper:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***150 grams of copper-II-oxide***, followed by ***60 grams of ground copper/aluminum alloy*** (50 to 65% copper by weight), followed by ***6 grams of tin oxide***, and then followed by ***3 grams of manganese dioxide.*** Thereafter, tumble the mixture for about 1 hour at 150 to 200 RPM. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 200 milliliters of acetone, and then blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: *68.49% copper-II-oxide, 27.39% copper/aluminum alloy, 2.73% tin oxide, 1.36% manganese dioxide, 0.03% mixed balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten copper for welding, cast forming, and for forming alloys.

06-02-019A: Pyrotechnic composition for welding copper:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***300 grams of copper-II-oxide***, followed by ***50 grams of ground copper/aluminum alloy*** (50 to 65% copper by weight), followed by ***50 grams of red phosphorus***, and then followed by ***75 grams of aluminum powder.*** Thereafter, tumble the mixture for about 1 hour at 150 to 200 RPM. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 150 milliliters of acetone, and then blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: *63.15% copper-II-oxide, 15.78% aluminum powder, 10.52% copper/aluminum alloy, 10.52% red phosphorus, 0.03% residual balance*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten copper for welding, cast forming, and for forming alloys.

06-02-020A: Pyrotechnic composition for welding copper:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***200 grams of copper-II-oxide***, followed by ***85 grams of ground copper/aluminum alloy*** (50 to 65% copper by weight), followed by ***5 grams of tin oxide***, and then followed by ***2.5 grams of manganese dioxide.*** Thereafter, tumble the mixture for about 1 hour at 150 to 200 RPM. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 75 milliliters of acetone, and then blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***68.37% copper-II-oxide, 29.05% copper/aluminum alloy, 1.7% tin oxide, 0.85% manganese dioxide, 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten copper for welding, cast forming, and for forming alloys.

06-02-020B: Pyrotechnic composition for welding copper:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***400 grams of finely ground red copper scale***, followed by ***44 grams of aluminum powder***, followed by ***1 gram of tin oxide***, followed by ***1 gram of zinc oxide***, followed by ***1 gram of a 50/50 alloy of zirconium and aluminum***, and then followed by ***1 gram of ferro/silicon alloy.*** Thereafter, tumble the mixture for about 1 hour at 150 to 200 RPM. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 75 milliliters of acetone, and then blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***89.28% red copper scale, 9.82% aluminum powder, 0.22% tin oxide, 0.22% zinc oxide, 0.22% zirconium aluminum alloy, 0.22% ferro/silicon alloy, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten copper for welding, cast forming, and for forming alloys.

06-02-021A: Pyrotechnic composition for welding copper and tin:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***234 grams of finely ground tin oxide***, followed by ***211 grams of aluminum powder***, Thereafter, tumble the mixture for about 1 hour at 150. Thereafter, add in ***36.5 grams of copper-I-oxide***, followed by ***18.5 grams calcium fluoride***. Thereafter, tumble the mixture at 200 RPM for about 2 hours. Note: during the tumbling process, spray in, in small portions at a time, 75 milliliters of 95% ethyl alcohol. After the tumbling process, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.8% tin oxide, 42.2% aluminum powder, 7.3% copper-I-oxide, 3.7% calcium fluoride***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten copper and tin for welding, cast forming, and for forming alloys.

06-02-021B: Pyrotechnic composition for welding copper and tin:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***262 grams of finely ground tin oxide***, followed by ***143 grams of aluminum powder***, Thereafter, tumble the mixture for about 1 hour at 150. Thereafter, add in ***75 grams of finely divided 50/50 aluminum/copper alloy***, followed by ***20 grams calcium fluoride***. Thereafter, tumble the mixture at 200 RPM for about 2 hours. Note: during the tumbling process, spray in, in small portions at a time, 75 milliliters of 95% ethyl alcohol. After the tumbling process, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.4% tin oxide, 28.6% aluminum powder, 15% 50/50 aluminum copper alloy, 4% calcium fluoride***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten copper and tin for welding, cast forming, and for forming alloys.

06-02-021C: Pyrotechnic composition for welding silver:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***274 grams of finely ground tin oxide***, followed by ***72 grams of aluminum powder***, and then followed by ***96.5 grams of finely ground silver***. Thereafter, tumble the mixture for about 1 hour at 150. Thereafter, add in ***35.5 grams of copper-I-oxide***, and then followed by ***22 grams calcium fluoride.*** Thereafter, tumble the mixture at 150 RPM for about 2 hours. Note: during the tumbling process, spray in, in small portions at a time, 75 milliliters of acetone. After the tumbling process, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54.8% tin oxide, 19.3% silver, 14.4% aluminum powder, 7.1% copper-I-oxide, 4.4% calcium fluoride***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten silver and tin for welding, cast forming, and for forming alloys.

06-02-021D: Pyrotechnic composition for welding nickel:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***279 grams of finely ground tin oxide***, followed by ***71.5 grams of aluminum powder***, and then followed by ***91 grams of finely ground nickel***. Thereafter, tumble the mixture for about 1 hour at 150. Thereafter, add in ***35.5 grams of copper-I-oxide***, and then followed by ***23 grams calcium fluoride.*** Thereafter, tumble the mixture at 150 RPM for about 2 hours. Note: during the tumbling process, spray in, in small portions at a time, 75 milliliters of acetone. After the tumbling process, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55.8% tin oxide, 18.2% nickel, 14.3% aluminum powder, 7.1% copper-I-oxide, 4.6% calcium fluoride***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten nickel and tin for welding, cast forming, and for forming alloys.

06-02-021E: Pyrotechnic composition for welding Tin:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***269.5 grams of finely ground tin oxide***, followed by ***70.5 grams of aluminum powder,*** and then followed by ***102 grams of finely ground tin***. Thereafter, tumble the mixture for about 1 hour at 150. Thereafter, add in ***35.5 grams of copper-I-oxide***, and then followed by ***22.5 grams calcium fluoride***. Thereafter, tumble the mixture at 150 RPM for about 2 hours. Note: during the tumbling process, spray in, in small portions at a time, 75 milliliters of acetone. After the tumbling process, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under high pressure (15,000 psi), and then cure the composition at ordinary temperature. Requires proper ignition composition for proper ignition, i.e., a magnesium containing material.

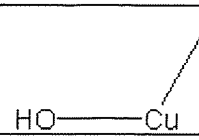
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: *53.9% tin oxide, 20.4% tin, 14.1% aluminum powder, 7.1% copper-I-oxide, 4.5% calcium fluoride*
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to generate molten tin for welding, cast forming, and for forming alloys.

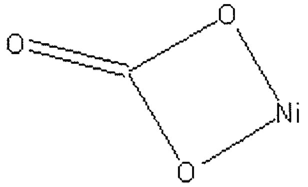
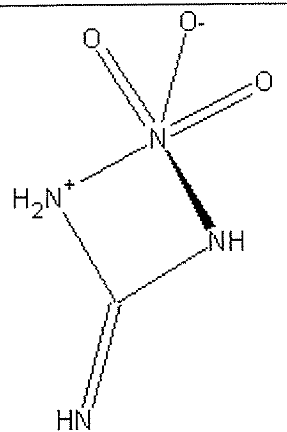
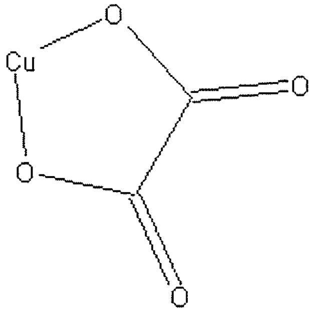
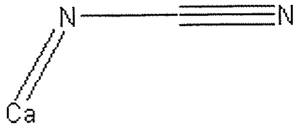
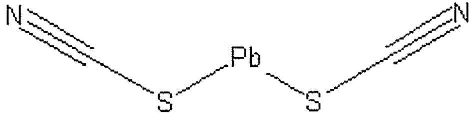
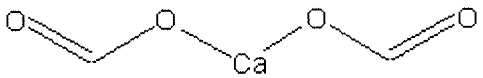
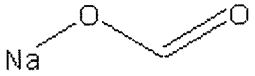
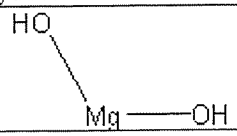
Section 3: Gas Generating Compositions for various purposes

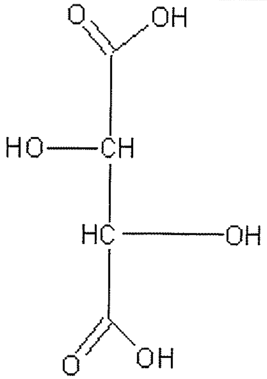
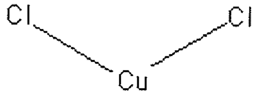
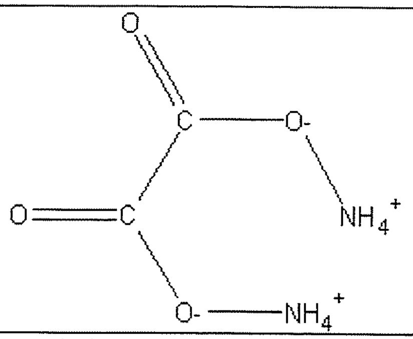
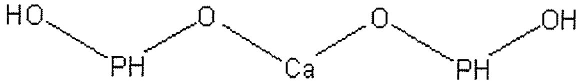
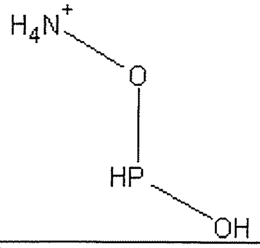
Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun	**70. Calcium Hydride (see Ammonium Nitrate Gun**

Propellants)		**Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)		**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)		**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)		**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)		**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)		**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)		**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)		**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)		**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)		**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)		**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)		**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)		**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)		**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)		**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)		**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)		**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)		**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)		**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)		**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)		**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)		**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)		**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)		**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)		**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)		**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)		**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)		**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)		**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)		**129. Bismuth Subnitrate (see Smoke Generating Compositions)**
130. Calcium Iodate (see Smoke Generating Compositions)		**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)		**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)		**135. Potassium Ferriccyanide (see Priming/Igniter Compositions)**
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)		**137. Bismuth Trioxide (see Priming/Igniter Compositions)**
138. Titanium powder (see Priming/Igniter Compositions)		**139. Tungsten powder (see Priming/Igniter Compositions)**
140. Lead Powder (see Priming/Igniter Compositions)		**141. Lead-II-Oxide (red lead; lithrage) (see Priming/Igniter Compositions)**
142. Selenium powder (see Priming/Igniter Compositions)		**143. Sodium Bicarbonate (see Priming/Igniter Compositions)**
144. Iron powder (see Priming/Igniter Compositions)		**145. Silicon Dioxide (see Priming/Igniter Compositions)**
146. Lead Thiocyanate (see Priming/Igniter Compositions)		**147. Para-Nitrotoluene (see Priming/Igniter Compositions)**

148. Silver powder (see Priming/Igniter Compositions)		**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)		**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)		**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)		**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)		**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)		**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate (see Illumination/Flare and Signaling Compositions)		**161. Iodoform (see Illumination/Flare and Signaling Compositions)**
162. Lithium Nitrate (see Illumination/Flare and Signaling Compositions)		**163. Manganese Oxide (see Illumination/Flare and Signaling Compositions)**
164. Sodium Carbonate (see Illumination/Flare and Signaling Compositions)		**165. Molybdenum powder (see Illumination/Flare and Signaling Compositions)**
166. Sodium Oxalate (see Illumination/Flare and Signaling Compositions)		**167. Oxalic Acid (see Illumination/Flare and Signaling Compositions)**
168. Stearic acid (see Illumination/Flare and Signaling Compositions)		**169. Thorium Nitrate (see Illumination/Flare and Signaling Compositions)**
170. Cerium Nitrate (see Illumination/Flare and Signaling Compositions)		**171. Rubidium Nitrate (see Illumination/Flare and Signaling Compositions)**
172. Calcium metal (see Illumination/Flare and Signaling Compositions)		**173. Mercury-II-Chloride (see Illumination/Flare and Signaling Compositions)**
174. Zirconium Carbonate (see Illumination/Flare and Signaling Compositions)		**175. Barium Chloride (see Illumination/Flare and Signaling Compositions)**
176. Antimony powder (see Pyrotechnic Delay Compositions)		**177. Chromium metal (see Pyrotechnic Delay Compositions)**
178. Zinc powder (see Pyrotechnic Delay Compositions)		**179. Tin Dioxide (see Pyrotechnic Delay Compositions)**
180. Silver-I-Chromate (see Pyrotechnic Delay Compositions)		**181. Calcium Chromate (see Pyrotechnic Delay Compositions)**
182. Strontium Chromate (see Pyrotechnic Delay Compositions)		**183. Silver-I-Oxide (see Pyrotechnic Delay Compositions)**
184. Calcium Fluoride (see Pyrotechnic Delay Compositions)		**185. Paraffin (see Incendiary Compositions)**
186. Sodium Peroxide (see Incendiary Compositions)		**187. Metallic Lithium (see Incendiary Compositions)**
188. Calcium Carbide (see Incendiary Compositions)		**189. Ferrocene (see Incendiary Compositions)**
190. Lime (calcium oxide) (see Incendiary Compositions)		**191. Aluminum Oleate (see Incendiary Compositions)**
192. Aluminum Palmitate (see Incendiary Compositions)		**193. Zinc Stearate (see Incendiary Compositions)**
194. Silver Iodate (see Cloud Seeding Compositions)		**195. Silver-Chloride (see Cloud Seeding Compositions)**
196. Lead Acetate (see Cloud Seeding Compositions)		**197. Silver Nitrate (see Cloud Seeding Compositions)**
198. Polyethylene Glycol (see Cloud Seeding Compositions)		**199. Iodine Pentoxide (see Cloud Seeding Compositions)**
200. Nickel powder (see Pyrotechnic Welding Compositions)		**201. Tungsten Oxide (see Pyrotechnic Welding Compositions)**
202. Graphite (see Pyrotechnic Welding Compositions)		**203. Cobalt Oxide (see Pyrotechnic Welding Compositions)**
204. Chromium Trioxide (see Pyrotechnic Welding Compositions)		**205. Chromium-III-Oxide (see Pyrotechnic Welding Compositions)**
206. Cryolite (see Pyrotechnic Welding Compositions)		**207. Tin Oxide (see Pyrotechnic Welding Compositions)**
208. Calcium Fluoride (see Pyrotechnic Welding Compositions)		**209. Iron Tetraoxide (Ferrosoferric oxide) (see Pyrotechnic Welding Compositions)**
210. Sodium dichromate (see Pyrotechnic Welding Compositions)		**211. Sodium Silicate (see Pyrotechnic Welding Compositions)**
212. Copper hydroxide		**213. Silicotungstic acid**
		$H_4[SiO_4.(W_3O_9)_4]$
Forms a nice bluish-green powder or bluish gel. The powder is insoluble in water and alcohol, but soluble in acids with the formations of salts. The powder is stable at room temperature		Forms a white to slightly yellow crystalline powder. The powder is very soluble in water, but insoluble in the usual solvents.

but will break down to the black oxide when heated.	
214. Nickel Carbonate	**215. Guanidine Nitrate**
	
Forms a tetrahydrate, which exists as a greenish crystalline powder. The powder is insoluble in water and the usual solvents. Reacts vigorously with acids with the formation of carbon dioxide.	Forms brilliant colorless crystals, or white granules or powder. The crystals are soluble in water and alcohol, and have a melting point of 214 Celsius. The crystals are made by dissolving guanidine in dilute nitric acid, followed by crystallization.
216. Cupric Oxalate	**217. Calcium Cyanamide**
	
Forms a fine bluish-green solid. The solid becomes anhydrous when heated to 200 Celsius. The powder is insoluble in water and the usual solvents.	Forms grayish black lumps, granules, or powder. Commercial grade product may contain traces of calcium carbide that will generate acetylene gas on prolonged storage, so containers should be vented periodically.
218. Lead Thiocyanate	**219. Calcium Formate**
	
Forms a fine white odorless powder or granules. The solid is toxic, so users should wear proper gloves and avoid inhalation of the dust. Lead thiocyanate is insoluble in water, and the usual solvents.	Forms colorless crystals, or white granules or powder. The crystals are stable at room temperature, but tend to decompose on heating. The powder is soluble in water, but relatively insoluble in alcohol and other solvents.
220. Sodium Formate	**221. Magnesium Hydroxide**
	
Forms colorless crystals or white granules or powder. The crystals have a melting point of 253 Celsius, with decomposition starting at higher temperatures. The crystals are soluble in water, but insoluble in alcohol and other solvents.	Forms a bulky white powder, that forms a dispersion in water. The powder reacts with acids, and is insoluble in water and all known solvents.
222. Tartaric Acid	**223. Copper-II-Chloride**

	
Forms a monohydrate, which exists as colorless crystals, white granules or powder. Tartaric acid exits in four isomers. All isomers are crystalline solids with melting points ranging from 140 to 200 Celsius. The crystals are soluble in water, but only slightly soluble in alcohol and other solvents.	The anhydrous form exists as yellowish-brown crystals, or crystalline powder. The crystals partially decompose when heated to above 300 Celsius. Copper chloride forms hydrates, with the dihydrate being the most common, and it forms a bluish green mass.
224. Ammonium Oxalate	**225. Calcium Hypophosphite**
	
Forms brilliant colorless crystals, or white granules or powder. The crystals are poisonous, so users should wear gloves when handling. The crystals are slightly soluble in water, but relatively insoluble in alcohol, and other common solvents.	Forms colorless crystals or white granules or powder. The crystals decompose into spontaneously combustible phosphine upon heating above 300 Celsius. Use caution when mixing this compound with oxidizers. The crystals are soluble in water, but insoluble in other solvents.
226. Ammonium Hypophosphite	
	
Forms beautiful colorless crystals, or white granules or powder. The crystals are very hygroscopic and readily absorb moisture. The crystals decompose into the dangerous gas, phosphine when heated. Ammonium hypophosphite is soluble in water and alcohol.	

- Gas Generating Compositions in this section -

1. 06-03-001A: Non-toxic pyrotechnic gas generating composition for automobile air-bags: *73.4% cupric hydroxide, 20.4% silicotungstic acid, 6.1% boron, 0.1% moisture*	**2. 06-03-001B: Non-toxic pyrotechnic gas generating composition for automobile (modified) air-bags:** *93% cupric hydroxide, 6.8% boron, 0.20% moisture*
3. 06-03-001C: Pyrotechnic gas generating composition for automobile (modified) air-bags: *84.5% cupric hydroxide, 12% zirconium hydride, 3.4% boron, 0.10% moisture*	**4. 06-03-002A: Non toxic gas producing pyrotechnic gas generating composition for automobile air-bags:** *50% potassium chlorate, 44% nickel carbonate, 6% charcoal*
5. 06-03-003A: Gas producing pyrotechnic composition for automobile air-bags and other inflation devices: *46.8% guanidine nitrate, 20% cupric oxalate hemi-hydrate, 18.8%*	**6. 06-03-004A: Gas producing pyrotechnic composition for automobile air-bags and other inflation devices:** *46.6% guanidine nitrate, 45.3% ammonium nitrate, 8% potassium*

ammonium perchlorate, 14.2% sodium nitrate, 0.20% silica	*nitrate, 0.10% impurities*
7. 06-03-005A: Gas producing pyrotechnic composition for non-automobile air-bags and other inflation devices: *78.6% ceric ammonium nitrate, 20.7% cellulose acetate, 0.62% silica, 0.08% residue*	**8. 06-03-005B: Gas producing pyrotechnic composition for automobile air bags and other inflation devices:** *57.9% ceric ammonium nitrate, 41.6% guanidine nitrate, 0.4% silica, 0.1% residue*
9. 06-03-006A: Modified "Thermite" composition for use in airbag inflation units: *61.6% iron oxide, 26.2% aluminum, 10.1% hydrated calcium sulfate, 2% potassium perchlorate, 0.10% residue*	**10. 06-03-007A: Pyrotechnic composition for use in airbag inflation units (barium chromate precipitation method):** *98.3% barium chromate, 1.6% amorphous boron, 0.10% residue*
11. 06-03-008A: Pyrotechnic composition with reduced heat output for use in airbag inflation units: *80.2% cupric hydroxide, 19.7% titanium, 0.10% moisture*	**12. 06-03-009A: Non toxic pyrotechnic composition with increased gas volume for use in airbag inflation units:** *65% sodium nitrate, 35% calcium cyanamide*
13. 06-03-009B: Non toxic pyrotechnic composition with increased gas volume for use in airbag inflation units utilizing dicyanodiamide: *65% sodium nitrate, 35% calcium cyanamide*	**14. 06-03-010A: Gas generating composition for inflating air bags for multiple purposes:** *48.3% lead thiocyanate, 48.3% potassium chlorate, 2.7% elvanol RTM binder, 0.58% aerosil TRM binder aid, 0.12% residues*
15. 06-03-010B: Gas generating composition for inflating automobile air bags with decreased flame temperature for minimizing burns: *45.4% sodium chlorate, 34.8% lead thiocyanate, 17.9% calcium hydroxide, 1.8% aerosil TRM binder aid, 0.10% residues*	**16. 06-03-011A: Gas generating composition for inflating automobile air bags:** *73.1% potassium chlorate, 26.9% D-glucose*
17. 06-03-012A: Simple gas generating composition for inflating automobile air bags: *60% potassium chlorate, 20% magnesium carbonate, 19.4% sucrose, 0.6% starch*	**18. 06-03-013A: Simple gas generating composition for inflating automobile air bags with reduced heat output reducing injury to victims:** *60% calcium formate, 40% potassium chlorate*
19. 06-03-013B: Simple gas generating composition for inflating automobile air bags with reduced heat output reducing injury to victims (modified): *40% potassium chlorate, 30% sodium formate, 30% potassium acid oxalate*	**20. 06-03-014A: Gas generating composition for inflating automobile air bags and other inflation uses:** *50% sodium chlorite, 41% calcium hydroxide, 8% acetal copolymer, 0.9% rounded balance, 0.1% carbon black*
21. 06-03-014B: Gas generating composition for inflating automobile air bags and other inflation uses: *45% magnesium hydroxide, 40% potassium chlorite, 15% polyvinyl acetate*	**22. 06-03-015A: Gas generating composition for inflating automobile air bags and other inflation uses:** *58.6% sodium chlorate, 22.7% tartaric acid, 18.6% calcium hydroxide, 0.1% carbon black*
23. 06-03-016A: Azide containing gas generating composition for inflating automobile air bags and other inflation uses: *78% sodium azide, 19% iron oxide, 3% pyrotechnic coating*	**24. 06-03-016B: Azide containing gas-generating composition for inflating automobile air bags and other inflation uses:** *57.9% sodium azide, 34.6% red iron oxide, 3% graphite, 2.5% bentonite, 2% sodium nitrate*
25. 06-03-017A: Simplified "flameless" gas generating composition for multiple uses: *80% guanidine nitrate, 20% tartaric acid*	**26. 06-03-017B: Simplified "flameless" gas generating composition for multiple uses (modified with glucose):** *90% guanidine nitrate, 10% glucose*
27. 06-03-018A: Gas generating composition with low temperature burning flame for commercial and industrial applications: *43.68% ammonium perchlorate, 27.18% hydroxyl ammonium oxalate, 23.76% polyester binder, 2% aziridine curing catalyst, 1.94% ammonium dichromate burn catalyst, 1.37% phosphine oxide curing catalyst, 0.07% residual mixed balance*	**28. 06-03-019A: Smokeless gas generating composition with low temperature burning flame for commercial and industrial applications:** *65.25% ammonium nitrate, 13.05% methyl acrylate, 11.41% binder, 4.89% styrene, 4.07% ammonium dichromate burn catalyst, 0.81% methyl ethyl ketone peroxide cure catalyst, 0.4% lecithin cure catalyst, 0.081% cobalt octoate cure catalyst, 0.039% mixed balance*
29. 06-03-020A: Smokeless gas generating composition for commercial and industrial applications: *72.03% ammonium nitrate, 17.35% polyester binder, 8.6% diglycidyl ether, 1% 4,4'-methylenedianiline, 1% barbituric acid, 0.02% mixed balance*	**30. 06-03-021A: Gas generating composition for commercial and industrial applications:** *96.03% guanidine nitrate, 2.97% copper-II-chloride, 0.99% vanadium pentoxide burn catalyst, 0.01% mixed balance*
31. 06-03-021B: Gas generating composition for commercial and industrial applications: *88.23% guanidine nitrate, 9.8% ammonium dichromate, 0.98% copper-II-chloride, 0.98% vanadium pentoxide burn catalyst, 0.01% mixed balance*	**32. 06-03-022A: Gas generating composition for military and industrial applications:** *33.76% ammonium nitrate, 31.96% guanidine nitrate, 24.77% dolomite, 3.79% potassium nitrate, 3.69% ammonium dichromate, 1.99% copper-II-oxalate, 0.04% mixed balance*
33. 06-03-022B: Gas generating composition for military and industrial applications: *39.63% dolomite, 27.12% ammonium nitrate, 25.62% guanidine nitrate, 2.8% potassium nitrate, 2.8% ammonium dichromate, 2% copper-II-oxide, 0.03 residual balance.*	**34. 06-03-022C: Gas generating composition for military and industrial applications:** *34.2% guanidine nitrate, 32.3% ammonium nitrate, 25% magnesite, 3.8% potassium nitrate, 3.7% ammonium dichromate, 1% copper-II-oxide*
35. 06-03-023A: Gas generating composition for various applications*: 48% potassium perchlorate, 46% zirconium metal, 5% Viton B binder, 1% graphite powder*	**36. 06-03-024A: Specialty "flameless" gas generating composition for industrial applications:** *80% guanidine nitrate, 20% calcium hypophosphite*
37. 06-03-024B: Specialty gas generating composition for industrial applications: *69% nitrodicyandiamide, 27.5% ammonium nitrate, 3.5% ammonium hypophosphite*	**38. 06-03-024C: Specialty gas generating composition for industrial applications:** *52% guanidine nitrate, 35% ammonium hypophosphite, 13% potassium nitrate*

06-03-001A: Non-toxic pyrotechnic gas generating composition for automobile air bags:
Into a suitable blender equipped with plastic stir blade, place 900 milliliters of methanol, followed by ***100 grams of silicotungstic acid*** (SiO2-12WO3-26H2O). Thereafter, rapidly blend the mixture to dissolve the silicotungstic acid. If all the silicotungstic acid fails to dissolve, add in more methanol until it does. After the silicotungstic acid has dissolved, add in ***360 grams of finally divided cupric hydroxide***, and then followed by ***30 grams of finely divided elemental boron***. Thereafter, blend the mixture for about 2 hours on high. After blending for 2 hours, heat the mixture to about 70 Celsius and boil-off about 75% of the methanol. Note: a distillation apparatus can be used to recover the methanol. Once about 75% of the methanol has been evaporated, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, filter-off the insoluble mass using gravity filtration or vacuum filtration, and then place the filtered mass onto a shallow tray, and allow it to thoroughly air-dry for several days. Afterwards, The mixture is ready to be used, but it needs to be ball milled using Teflon coated steel shot of any desirable diameter for several hours to form a uniform powder. Thereafter, this powder should be pressed into pellets of any desirable shape using a standard press under high pressure (9000 psi).
Burn rate: 4 gram pellet burns at 0.40 inches per second.
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***73.4% cupric hydroxide, 20.4% silicotungstic acid, 6.1% boron, 0.1% moisture***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in automobiles to inflate air bags during accidents.

06-03-001B: Non-toxic pyrotechnic gas generating composition for automobile (modified) air bags:
Into a suitable blender equipped with plastic stir blade, place 150 milliliters of acetone, followed by ***465 grams of cupric hydroxide***. Thereafter, rapidly blend the mixture for about 30 minutes to form a wet paste. After stirring for 30 minutes, add in ***34 grams of finely divided elemental boron***, and then blend the mixture for about 2 hours on high. After blending for 2 hours, filter-off the insoluble mass using gravity filtration or vacuum filtration, and then place the filtered mass onto a shallow tray, and allow it to thoroughly air-dry for several days. Afterwards. The mixture is ready to be used, but it needs to be ball milled using Teflon coated steel shot of any desirable diameter for several hours to form a uniform powder. Thereafter, this powder should be pressed into pellets of any desirable shape using a standard press under high pressure (9000 psi).
Burn rate: 4 gram pellet burns at 0.50 inches per second at 1000 psi. (0.3 inches per second at 300 psi).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 - 9
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***93% cupric hydroxide, 6.8% boron, 0.20% moisture***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used in automobiles to inflate air bags during accidents.

06-03-001C: Pyrotechnic gas generating composition for automobile (modified) air bags:
Into a suitable blender equipped with plastic stir blade, place 150 milliliters of acetone, followed by ***422 grams of cupric hydroxide***. Thereafter, rapidly blend the mixture for about 30 minutes to form a wet paste. After stirring for 30 minutes, add in ***17 grams of finely divided elemental boron***, followed by ***60 grams of finely divided zirconium hydride,*** and then blend the mixture for about 2 hours on high. After blending for 2 hours, filter-off the insoluble mass using gravity filtration or vacuum filtration, and then place the filtered mass onto a shallow tray, and allow it to thoroughly air-dry for several days. Afterwards. The mixture is ready to be used, but it needs to be ball milled using Teflon coated steel shot of any desirable diameter for several hours to form a uniform powder. Thereafter, this powder should be pressed into pellets of any desirable shape using a standard press under high pressure (9000 psi).

Burn rate: 4 gram pellet burns at 0.3 inches per second at 1000 psi.
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***84.5% cupric hydroxide, 12% zirconium hydride, 3.4% boron, 0.10% moisture***
Classification: Deflagrating explosive (classified as pyrotechnic mixture)
Use: Used in automobiles to inflate air bags during accidents.

06-03-002A: Non-toxic gas producing pyrotechnic gas generating composition for automobile air bags:
Into a suitable blender equipped with plastic stir blade, place 150 milliliters of acetone, followed by ***30 grams of soft wood charcoal***. Thereafter, rapidly blend the mixture for about 30 minutes to form a pasty mass. After stirring for 30 minutes, add in ***220 grams of nickel carbonate***, and then continue to stir the mixture for about 30 minutes. After 30 minutes, add in ***250 grams of potassium chlorate***, and then blend the mixture for about 2 hours on high. Note: During the blending operation, the acetone will evaporate, so additional acetone should be added periodically during the blending operation to maintain a pasty mass. After blending for 2 hours, cease the acetone addition, and then continue to blend the mixture on moderate speed until the bulk of the acetone evaporates. Thereafter, place the dough-like mixture onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill filled with 150 grams or so of Teflon coated steel shot, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform powder. Thereafter, the powdered mixture is ready for use. To use, it needs to be pressed into pellets of any desirable shape using a standard hydraulic press or equivalent under high pressure (20,000 psi).
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium chlorate, 44% nickel carbonate, 6% charcoal***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in automobiles to inflate air bags during accidents.

06-03-003A: Gas producing pyrotechnic composition for automobile air bags and other inflation devices:
Into a standard "vertical" ball mill or similar device, filled with about 100 grams or so of Teflon coated steel shot of 5 to 10 millimeters in diameter, place ***234 grams of guanidine nitrate***, followed by ***100 grams of cupric oxalate hemi-hydrate***, followed by ***71 grams of sodium nitrate***, followed by 75 milliliters of hexane or toluene, and then rotate the mixture on high for about 30 minutes. After 30 minutes, add in ***94 grams of ammonium perchlorate***, followed by ***1 gram of powdered silica***, and then add in 50 milliliters of additional hexane, and then continue to rotate the mixture for about 30 minutes. After 30 minutes place the entire pasty mixture onto a shallow pan, and allow it to thoroughly air-dry. Once it has thoroughly dried, place the dried mass into a clean horizontal ball mill, filled with 150 grams of Teflon coated steel shot of any desirable diameter, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform powder. After 1 hour, the mixture is ready to use. To use, simply press it into pellets or discs of any desirable size under a pressure of about 10,000 psi under the usual techniques.
Burn rate: Fast.
Flame temperature: 1700 Celsius.
Gas generation: 3.1 moles per 100-gram sample
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.8% guanidine nitrate, 20% cupric oxalate hemi-hydrate, 18.8% ammonium perchlorate, 14.2% sodium nitrate, 0.20% silica***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in automobiles to inflate air bags and used in a variety of inflation devices.

06-03-004A: Gas producing pyrotechnic composition for automobile air bags and other inflation devices:
In typical fashion, into a standard "vertical" ball mill or similar device, filled with about 100 grams or so of Teflon coated steel shot of 5 to 10 millimeters in diameter, place ***226.5 grams of ammonium nitrate***, followed by ***40 grams of potassium nitrate***, and then followed by ***233 grams of guanidine nitrate***, and then rotate the mixture on high for about 30 minutes. After 30 minutes, the mixture is ready to use. To use, simply press it into pellets or discs of any desirable size under a pressure of about 3000 psi under the usual techniques.

Burn rate: 0.2 inches per second at 1000 psi
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***46.6% guanidine nitrate, 45.3% ammonium nitrate, 8% potassium nitrate, 0.10% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in automobiles to inflate air bags and used in a variety of inflation devices.

06-03-005A: Gas producing pyrotechnic composition for non-automobile air bags and other inflation devices:
In familiar fashion, place into any desirable mixing bowl, blender, or similar device, equipped with motorized stirrer using a plastic blade, 150 milliliters of acetone, followed by ***380 grams of ceric ammonium nitrate***, followed by ***100 grams of cellulose acetate***, and then followed by ***3 grams of powdered silica***, and then blend the mixture on moderate speed for about 1 hour. After 1 hour, some of the acetone would have evaporated, never mind this, and then place the blended mixture onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mixture into any suitable horizontal ball mill, filled with 150 grams of Teflon coated steel shot of any suitable diameter, and then tumble the mixture for about 30 minutes at 200 to 250 RPM to form a uniform mixture. Afterwards, the mixture is ready to go. To do so, it needs to be pressed into pellets, discs, ect., of any desirable size under a pressure of about 5000 psi.
Burn rate: Average.
Non-gas products: 24%
Flame temperature: 2500 Celsius at 1000 psi.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***78.6% ceric ammonium nitrate, 20.7% cellulose acetate, 0.62% silica, 0.08% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military and commercial inflation devices. Should not be used in automobile airbags due to excessive flame temperature that could cause burns.

06-03-005B: Gas producing pyrotechnic composition for automobile air bags and other inflation devices:
In familiar fashion, place into any desirable mixing bowl, blender, or similar device, equipped with motorized stirrer using a plastic blade, 150 milliliters of acetone, followed by ***208 grams of ceric ammonium nitrate***, followed by ***289 grams of guanidine nitrate***, and then followed by ***2 grams of powdered silica***, and then blend the mixture on moderate speed for about 1 hour. After 1 hour, some of the acetone would have evaporated, never mind this, and then place the blended mixture onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mixture into any suitable horizontal ball mill, filled with 150 grams of Teflon coated steel shot of any suitable diameter, and then tumble the mixture for about 30 minutes at 200 to 250 RPM to form a uniform mixture. Afterwards, the mixture is ready to go. To do so, it needs to be pressed into pellets, discs, ect., of any desirable size under a pressure of about 5000 psi.
Burn rate: Average.
Non-gas products: 13+%
Flame temperature: 2100 Celsius at 5000 psi.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***57.9% ceric ammonium nitrate, 41.6% guanidine nitrate, 0.4% silica, 0.1% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in military and commercial inflation devices and in automobile airbags.

06-03-006A: Modified "Thermite" composition for use in airbag inflation units:

Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***305*** ***grams of finely divided red iron-III-oxide***, followed by ***130 grams of standard powdered aluminum of average mesh***, followed by ***10 grams of potassium perchlorate,*** followed by ***50 grams of finely divided hydrated calcium sulfate,*** and then followed by 250 milliliters of acetone, and then blend the mixture at moderate speed until the bulk of the acetone has evaporated, and a mild pasty mass remains. Once a mild pasty mass remains, the mixture is ready to use. To use, it simply needs to be pressed into pellets of any desirable size, but preferably of about 6 to 7 millimeters in diameter by 5 to 10 millimeters in diameter under mild pressure, and then allowed to cure for a day or so to allow for proper drying. Obviously, larger pellets can be formed depending on the size of the desired inflation. Note: requires proper ignition composition.
Burn rate: Average.
Flame temperature: 2200+ Celsius at 1000 psi.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.6% iron oxide, 26.2% aluminum, 10.1% hydrated calcium sulfate, 2% potassium perchlorate, 0.10% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in automobile airbags, and other inflation devices.

06-03-007A: Pyrotechnic composition for use in airbag inflation units (barium chromate precipitation method):

Into a suitable sized beaker or similar container, place 300 milliliters of water, and then add and dissolve ***90 grams of barium chloride*** there into. Next, into another clean beaker or similar container, prepare a second solution by adding and dissolving ***90 grams of sodium dichromate*** into 300 milliliters of water. Now, heat the barium chloride solution to 95 Celsius with stirring, and then add in ***2.1 grams of finely divided amorphous boron***, and then stir the mixture for about 10 minutes at 95 Celsius. After 10 minutes, add in the sodium dichromate solution, and then continue to stir the total mixture at about 95 Celsius for about 15 minutes. After 15 minutes, remove the heat source, and then gravity filter or vacuum filter the insoluble mass before the mixture cools. Thereafter, place the filtered-off mass onto a shallow pan and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean horizontal ball mill, filled with 100 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 150 RPM for about 30 minutes. Thereafter, the mixture is ready for use. To use, the dried pulverized mixture needs to be pressed into any desirable container, tube, ect., under a pressure of 500 psi. Requires ignition composition, but can be ignited using Nichrome wire and 9 volt battery or equivalent.
Burn rate: 3 seconds per centimeter at 0.5 centimeter diameter pellets.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Moderate. Capable of detonating on ignition.
Percentage: ***98.3% barium chromate, 1.6% amorphous boron, 0.10% residue***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices.

06-03-008A: Pyrotechnic composition with reduced heat output for use in airbag inflation units:

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, place 150 milliliters of acetone, followed by ***401 grams of cupric hydroxide***, followed by ***98.5 grams of titanium powder*** of average mesh, and then blend the mixture on moderate speed until the bulk of the acetone evaporates. Once that point has been reached, place the semi-pasty mass onto a shallow pan and allow it to thoroughly air-dry. Once it has, the dried mass needs to be pulverized in the usual manner, so place it into a clean ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mass at 150 RPM for about 30 minutes. After 30 minutes, the mixture is ready for use. To use, it simply needs to be pressed into pellets of any desirable size under a pressure of about 5000 psi. It can then be ignited using any suitable bridge wire, such as Nichrome wire.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Moderate. Capable of detonating on ignition.
Percentage: ***80.2% cupric hydroxide, 19.7% titanium, 0.10% moisture***
Classification: Deflagrating explosive (classified as explosive mixture).

Use: Can be used in automobile airbags, and other inflation devices.

06-03-009A: Non-toxic pyrotechnic composition with increased gas volume for use in airbag inflation units:

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, place 150 milliliters of hexane, followed by ***175 grams of calcium cyanamide***, followed by ***325 grams of sodium nitrate*** of average mesh, and then blend the mixture on moderate speed until the bulk of the hexane evaporates. Once that point has been reached, place the semi-pasty mass onto a shallow pan and allow it to thoroughly air-dry. Once it has, the dried mass needs to be pulverized in the usual manner, so place it into a clean ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mass at 100 RPM for about 30 minutes. After 30 minutes, the mixture is ready for use. To use, it simply needs to be pressed into pellets of any desirable size under a pressure of about 5000 psi. It can then be ignited using any suitable bridge wire, such as Nichrome wire.
Burn rate: 0.6 inches per second.
Burn temperature: 1800 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***65% sodium nitrate, 35% calcium cyanamide***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-009B: Non-toxic pyrotechnic composition with increased gas volume for use in airbag inflation units utilizing dicyanodiamide:

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, place 150 milliliters of methylene chloride, followed by ***124 grams of dicyanodiamide***, followed by ***375 grams of sodium nitrate*** of average mesh, and then blend the mixture on moderate speed until the bulk of the acetone evaporates. Once that point has been reached, place the semi-pasty mass onto a shallow pan and allow it to thoroughly air-dry. Once it has, the dried mass needs to be pulverized in the usual manner, so place it into a clean ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mass at 150+ RPM for about 30 to 40 minutes. After 30 to 40 minutes, the mixture is ready for use. To use, it simply needs to be pressed into pellets of any desirable size under a pressure of about 5000 psi. It can then be ignited using any suitable means.
Burn rate: 1 to 1.2 inches per second.
Burn temperature: 1860 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***65% sodium nitrate, 35% calcium cyanamide***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-010A: Gas generating composition for inflating air bags for multiple purposes:

Into a suitable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, place ***164 grams of lead thiocyanate***, followed by ***164 grams of potassium chlorate,*** followed by ***2 grams of "Aerosil RTM 300***, which is sold by the Degussa Corporation and is a hydrophilic silica having a high specific surface area, and then blend the mixture for about 30 minutes. Thereafter, add in a binder solution pre-prepared by adding ***9.5 grams of Elvanol RTM***, which is a brand of polyvinyl alcohol's (PVA) sold by du Pont into 160 milliliters of water, and then blend the mixture on moderate speed for about 30 minutes to form a uniform paste. After 30 minutes, place the pasty mixture onto a shallow aluminum tray, and then dry it in an oven at 95 Celsius for about 1 hour or more. To use, it simply needs to be pressed into pellets of any desirable size under a pressure of about 3000 psi. It can then be ignited using a hot wire, such as Nichrome wire.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: Explodes on ignition.

Percentage: ***48.3% lead thiocyanate, 48.3% potassium chlorate, 2.7% elvanol RTM binder, 0.58% aerosil TRM binder aid, 0.12% residues***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-010B: Gas generating composition for inflating automobile air bags with decreased flame temperature for minimizing burns:

Into a suitable beaker of similar container, place 230 milliliters of water, and then add and dissolve ***227.5 grams of sodium chlorate***. Thereafter, place this sodium chlorate solution into any desirable mixing bowl, blender, ect., equipped with motorized stirrer utilizing a plastic stir blade, and then add in ***174 grams of lead thiocyanate***, followed by ***89.5 grams of finely ground calcium hydroxide***, and then blend the dry mixture for about 30 minutes. Thereafter, add in ***9 grams of "Aerosil RTM 300***, which is sold by the Degussa Corporation and is a hydrophilic silica having a high specific surface area, and then blend the mixture on moderate speed for about 30 minutes to form a uniform paste. After 30 minutes, place the pasty mixture onto a shallow aluminum tray, and then allow it to air-dry in a current of warm air for several days to allow the water to evaporate. Note: heating an oven at 95 Celsius for about 24 hours or more may help speed up the process. To use, the dry material needs to be pressed into pellets of any desirable size under a pressure of about 3000 psi. It can then be ignited using a hot wire, such as Nichrome wire.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***45.4% sodium chlorate, 34.8% lead thiocyanate, 17.9% calcium hydroxide, 1.8% aerosil TRM binder aid, 0.10% residues***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-011A: Gas generating composition for inflating automobile air bags:

Into a suitable ball mill, filled with 100 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***134.5 grams of anhydrous D-glucose***, followed by ***365.5 grams of potassium chlorate***, and then tumble the mixture at 50 RPM for about 10 to 15 minutes. Thereafter, place this dried tumbled mixture into a suitable mixing container, bowl, blender, ect, equipped with motorized stirrer, and then add in 80 milliliters of water and then 10 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 15 to 20 minutes to form a paste. Thereafter, place the paste onto a shallow tray, and allow it to thoroughly air-dry for several days or more. Note: drying in an oven at 90 Celsius can be used to speed up the drying operation. Once the mixture is dried, it needs to be ball milled for a short time to thoroughly pulverize it. The finely ground pulverized mixture can then be pressed into any desirable pellets, discs, rods, ect., under a pressure of about 5000 psi. The mixture readily ignites in contact with hot wire.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***73.1% potassium chlorate, 26.9% D-glucose***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-012A: Simple gas generating composition for inflating automobile air bags:

Into a suitable mixing bowl, or blender, equipped with motorized stirrer, place ***97 grams of sucrose***, followed by ***3 grams of starch***, followed by ***300 grams of potassium chlorate***, followed by ***100 grams of magnesium carbonate***, and then followed by 150 milliliters of acetone. Thereafter, blend the mixture until the bulk of the acetone has evaporated. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and then allow it to thoroughly air-dry. Afterwards, place the dried mass into a ball mill, filled with 150 grams of Teflon coated steel shot, of the usual diameter, and then tumble the mixture at 200 RPM for about 30 minutes. Note: the ball mill should be equipped with a cover and drying tube to keep moisture out. After 30 minutes, the mixture is ready for use. To use, the mixture should be pressed into tablets, pellets, ect., in the usual manner under high pressure. The composition is readily fired by a hot wire, electric discharge, or electric squib in the usual manner. Note: a small capsule of water can be placed on or near the composition, so upon firing, the hot gasses vaporize the water forming high-pressure steam for increased inflation ability.
Burn rate: Average.
Water resistance: Good.

Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***60% potassium chlorate, 20% magnesium carbonate, 19.4% sucrose, 0.6% starch***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-013A: Simple gas generating composition for inflating automobile air bags with reduced heat output reducing injury to victims:

Into a suitable empty vertical ball mill, place ***180 grams of calcium formate***, followed by ***120 grams of potassium chlorate***, and then rotate the vertical device at about 150 to 300 RPM for about 1 hour to form a uniform powder. Thereafter, the simple mixture is ready for use. To use, the powder simply needs to be pressed into pellets or tablets under a pressure of about 10,000 psi in the usual means. The composition can be fired using any desired means.
Burn rate: Rapid. Average sample can inflate air bag in 50 milliseconds.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***60% calcium formate, 40% potassium chlorate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-013B: Simple gas generating composition for inflating automobile air bags with reduced heat output reducing injury to victims (modified):

Into a suitable empty vertical ball mill, place ***150 grams of sodium formate***, followed by ***150 grams of potassium acid oxalate***, and then followed ***200 grams of potassium chlorate***, and then rotate the vertical device at about 150 to 300 RPM for about 1 hour to form a uniform powder. Thereafter, the simple mixture is ready for use. To use, the powder simply needs to be pressed into pellets or tablets under a pressure of about 10,000 psi in the usual means. The composition can be fired using any desired means. Note: the sodium formate can be replaced with calcium formate, nickel formate, lead formate, zinc formate, ammonium formate, or magnesium formate.
Burn rate: Similar to 06-03-013A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***40% potassium chlorate, 30% sodium formate, 30% potassium acid oxalate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-014A: Gas generating composition for inflating automobile air bags and other inflation uses:

Into a suitable horizontal ball mill, filled with 200 grams of Teflon coated steel shot of the normal diameter (5 to 10 millimeters), place ***41.5 grams of an acetal copolymer*** (having a melt index of 9, and sold as "Celcon"), followed by ***206.5 grams of calcium hydroxide,*** followed ***252 grams of sodium chlorite***, and then followed by ***500 milligrams of carbon black.*** Thereafter, add in 500 milliliters of methylene chloride, and then tumble the mixture at 300 to 500 RPM for about 1 hour to form a uniform mixture. Thereafter, remove all the contents from the ball mill, and then place them into a distillation apparatus, and distill-off the methylene chloride at 40 Celsius until dry solid remains. Once dry solid remains, place the dried mass back into a clean dry ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use. To use, the powder simply needs to be pressed into pellets or tablets under a pressure of about 10,000 psi in the usual means. The composition can be fired using any desired means.
Burn rate: 1 inch per second at 3000 psi.
Combustion temperature: 980 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).

Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***50% sodium chlorite, 41% calcium hydroxide, 8% acetal copolymer, 0.9% rounded balance, 0.1% carbon black,***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-014B: Gas generating composition for inflating automobile air bags and other inflation uses:
Into a suitable horizontal ball mill, filled with 200 grams of Teflon coated steel shot of the normal diameter (5 to 10 millimeters), place ***75 grams of polyvinyl acetate***, followed by ***200 grams of potassium chlorite,*** and then followed by ***225 grams magnesium hydroxide.*** Thereafter, add in 500 milliliters of methylene chloride, and then tumble the mixture at 300 to 500 RPM for about 1 hour to form a uniform mixture. Thereafter, remove all the contents from the ball mill, and place them into a distillation apparatus, and distill-off the methylene chloride at 40 Celsius until dry solid remains. Thereafter, place the dried mass back into a clean dry ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use. To use, the powder simply needs to be pressed into pellets or tablets under a pressure of about 10,000 psi in the usual means. The composition can be fired using any desired means.
Burn rate: Similar to 06-03-014A.
Combustion temperature: Similar to 06-03-014A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***45% magnesium hydroxide, 40% potassium chlorite, 15% polyvinyl acetate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-015A: Gas generating composition for inflating automobile air bags and other inflation uses:
Into a suitable horizontal ball mill, filled with 200 grams of Teflon coated steel shot of the normal diameter (5 to 10 millimeters), place ***113.5 grams of tartaric acid***, followed by ***93 grams of calcium hydroxide,*** and followed by ***293 grams sodium chlorate,*** and then followed by ***500 milligrams of carbon black.*** Thereafter, add in 500 milliliters of methylene chloride, and then tumble the mixture at 300 to 500 RPM for about 1 hour to form a uniform mixture. Thereafter, remove all the contents from the ball mill, and place them into a distillation apparatus, and distill-off the methylene chloride at 40 Celsius until dry solid remains. Thereafter, place the dried mass back into a clean dry ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use. To use, the powder simply needs to be pressed into pellets or tablets under a pressure of about 10,000 psi in the usual means. The composition can be fired using any desired means.
Burn rate: 35 milliseconds per 1-gram pellet.
Combustion temperature: 1100 Celsius.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***58.6% sodium chlorate, 22.7% tartaric acid, 18.6% calcium hydroxide, 0.1% carbon black***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-016A: Azide containing gas-generating composition for inflating automobile air bags and other inflation uses:
Into a suitable horizontal ball mill, filled with 200 grams of Teflon coated steel shot of the normal diameter (5 to 10 millimeters), place ***400 grams of sodium azide***, followed by ***100 grams of red iron-III-oxide,*** and then add in 500 milliliters of methylene chloride, and then tumble the mixture at 200 to 250 RPM for about 1 hour to form a uniform mixture. Thereafter, remove all the contents from the ball mill, and then recover the insoluble mixture by simply filtering it off. Thereafter, place the filtered-off mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Thereafter, press the dried mass into pellets of any desired size under a pressure of 10,000 to 15,000 psi. Thereafter, coat the tablets by placing them into plastic bags filled with a promoter composition prepared by mixing 4 grams of polyvinyl acetate with 16 grams of sodium azide, and 30 grams of sodium perchlorate. Thereafter, the pellets are ready for use, and can be readily fired using any hot wire or electric squib in the usual manner.
Burn rate: similar to 06-03-015A.
Combustion temperature: 900 Celsius.

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***78% sodium azide, 19% iron oxide, 3% pyrotechnic coating***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

06-03-016B: Azide containing gas-generating composition for inflating automobile air bags and other inflation uses:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place 250 milliliters of hexane, and then add in ***115.8 grams of sodium azide***, followed by ***4 grams of sodium nitrate***, followed by ***5 grams of bentonite***, followed by ***6 grams of finely divided graphite***, and then finally followed by ***69.2 grams of red iron oxide***. Thereafter, blend the mixture on moderate speed for about 30 minutes. Note: you should keep the mixing bowl sealed to prevent evaporation of the solvent. Thereafter, the mixture is ready to be dried and tumbled. To do so, place the pasty mass onto a shallow tray or pan, and allow it to thoroughly dry. If desired, place the wet mixture into a vacuum apparatus, and remove the solvent under vacuum to recover it. Once the material is dry, place it into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, and then tumble the mixture on moderate speed for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into tablets or pellets of any desired size under a pressure of 10,000 psi.
Burn rate: Rapid.
Combustion temperature: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***57.9% sodium azide, 34.6% red iron oxide, 3% graphite, 2.5% bentonite, 2% sodium nitrate***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used in automobile airbags, and other inflation devices in the usual manner.

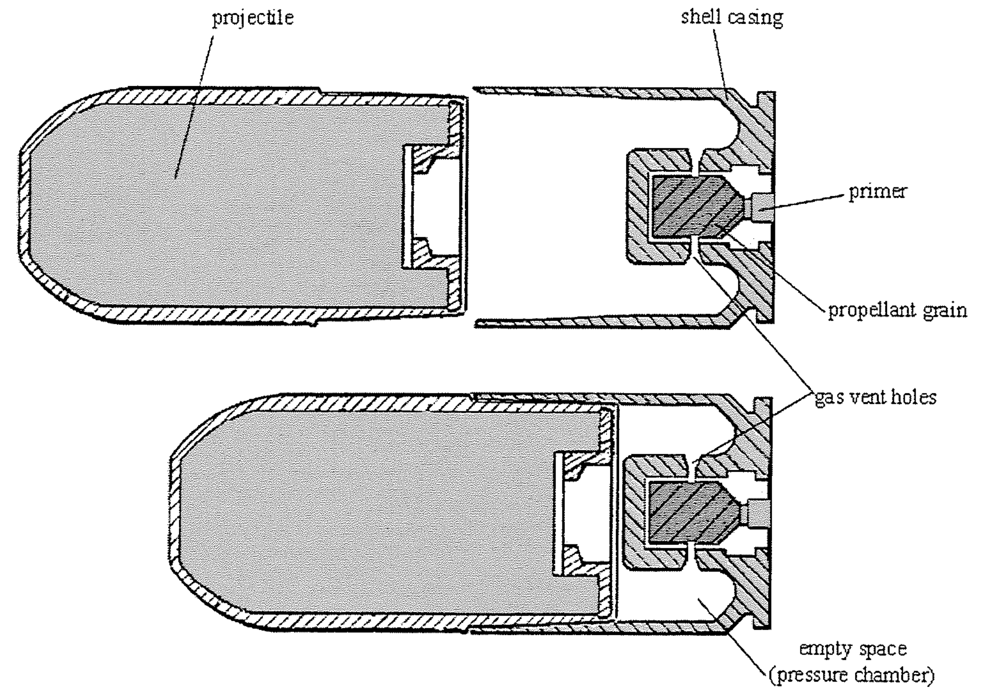
06-03-017A: Simplified "flameless" gas generating composition for multiple uses:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***240 grams of guanidine nitrate***, and then followed by ***60 grams of tartaric acid***. Thereafter, tumble the mixture for about 45 minutes at 250 RPM. Thereafter, separate the mixture from the steel shot using a screen, in the usual manner. Thereafter the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets or pellets under a high pressure for 10,000 psi. The mixture can be fired using an electric bridge wire, or flame.
Burn rate: Rapid.
Combustion temperature: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).
Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: ***80% guanidine nitrate, 20% tartaric acid***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used for inflation purposes, but not suitable for automobile airbags.

06-03-017B: Simplified "flameless" gas generating composition for multiple uses (modified with glucose):
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***360 grams of guanidine nitrate***, and then followed by ***40 grams of glucose***. Thereafter, tumble the mixture for about 45 minutes at 250 RPM. Thereafter, separate the mixture from the steel shot using a screen, in the usual manner. Thereafter the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets or pellets under a high pressure for 10,000 psi. The mixture can be fired using an electric bridge wire.
Burn rate: Rapid.
Combustion temperature: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9 (based on hot wire firing).

Tendency to cake: None.
Explosive ability: Explodes on ignition.
Percentage: *90% guanidine nitrate, 10% glucose*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used for inflation purposes, but not suitable for automobile airbags.

06-03-018A: Gas generating composition with low temperature burning flame for commercial and industrial applications:
Into a suitable mixing bowl, equipped with motorized stirrer, place 67.22 grams of adipic acid, followed by 47.43 grams of diethylene glycol. Thereafter, blend the mixture for about 10 minutes. Thereafter, place ***97.92 grams of this adipic acid/diethylene glycol mixture*** into a clean separate mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***8 grams of ammonium dichromate***, followed by ***112 grams of hydroxyl ammonium oxalate***. Thereafter, blend this mixture for about 10 minutes on moderate speed. Thereafter, add in ***180 grams of ammonium perchlorate***, and then continue to blend the mixture on moderate speed for about 30 minutes at room temperature. Thereafter, quickly add in ***5.68 grams of tris[1-(2-methyl)aziridinyl]phosphine oxide*** and then followed by ***8.4 grams of 1,1'-(sulfonyldiethylene)bis-2-methyl-aziridine***, and then continue to stir the mixture on moderate speed for about 20 additional minutes at room temperature. Finally, the mixture is ready for casting. To do so, the mixture should be poured and pressed into any desirable container, mold, ect., under mild pressure, and the following devices should then be cured in an oven at 60 Celsius for 24 hours. Thereafter, the mixture can be primed in the usual manner.
Burn rate: Slow.
Combustion temperature: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *43.68% ammonium perchlorate, 27.18% hydroxyl ammonium oxalate, 23.76% polyester binder, 2% aziridine curing catalyst, 1.94% ammonium dichromate burn catalyst, 1.37% phosphine oxide curing catalyst, 0.07% residual mixed balance*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used for producing gas pressure for commercial and industrial uses.

06-03-019A: Smokeless gas generating composition with low temperature burning flame for commercial and industrial applications:
Into a suitable mixing bowl, equipped with motorized stirrer, place 65.76 grams of adipic acid, followed by 58.36 grams of diethylene glycol, and then followed by 4.9 grams of maleic anhydride. Thereafter, blend the mixture at 140 Celsius for about 40 hours to drive off all water. Thereafter, remove the heat source, and allow the binder to cool to room temperature before using. Thereafter, place ***112 grams of this adipic acid/diethylene glycol/maleic anhydride mixture*** into a clean separate mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***48 grams of styrene***, followed by ***128 grams of methyl acrylate***, and then blend the mixture at a temperature of about 60 to 80 Celsius for about 1 hour. Thereafter, add in ***640 grams of ammonium nitrate***, and then followed by ***40 grams of ammonium dichromate***, and then continue to blend the mixture at 60 to 80 Celsius for about 30 minutes. Finally, add in ***4 grams of lecithin***, followed by ***800 milligrams of cobalt octoate***, and then followed by ***8 grams of methyl ethyl ketone peroxide***, and then blend the mixture at 60 to 80 Celsius for about 1 hour. Thereafter, the mixture is ready for casting. To do so, the mixture should be poured and pressed into any desirable container, mold, ect., under mild pressure, and the following devices should then be cured in an oven at ordinary temperatures for 24 hours. Thereafter, the mixture can be primed in the usual manner.
Burn rate: Moderate.
Combustion temperature: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *65.25% ammonium nitrate, 13.05% methyl acrylate, 11.41% binder, 4.89% styrene, 4.07% ammonium dichromate burn catalyst, 0.81% methyl ethyl ketone peroxide cure catalyst, 0.4% lecithin cure catalyst, 0.081% cobalt octoate cure catalyst, 0.039% mixed balance*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used for producing gas pressure for commercial and industrial uses. Can also be used in military applications for low pressure, low velocity systems such as grenade launchers, and smoke launchers.

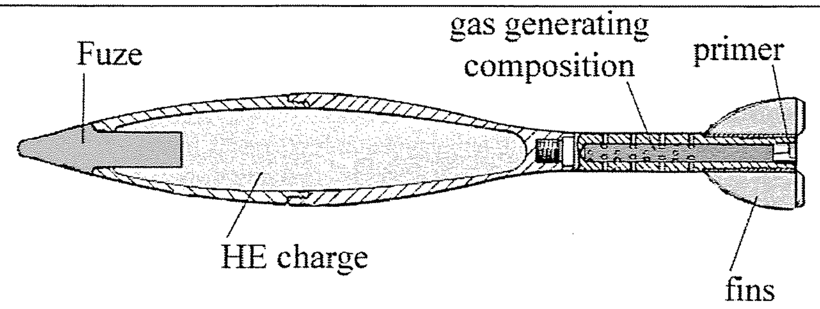
40mm grenade utilizing low pressure low recoil system	Description
 projectile shell casing primer propellant grain gas vent holes empty space (pressure chamber)	Low-pressure low recoil systems are commonly used in grenade launchers, and mortar weapons. In the adjacent illustration, a small amount of a propellant grain is ignited using a primer, and the gas generated thereby, is used to produce pressure. The pressure forces the shell down range.

06-03-020A: Smokeless gas generating composition for commercial and industrial applications:
Into a suitable mixing bowl, equipped with motorized stirrer, place 68.68 grams of adipic acid, and then followed by 47.43 grams of diethylene glycol, and then blend the mixture at 140 Celsius for about 40 hours to drive off all water. Thereafter, remove the heat source, and allow the binder to cool to room temperature before using. Thereafter, place ***86.75 grams of this adipic acid/diethylene glycol/ mixture*** into a clean separate mixing bowl, equipped with motorized stirrer in the usual manner, and then add in ***43 grams of diglycidyl ether of bisphenol A*** (sold as Epi-rez 510), followed by ***5 grams of 4,4'-methylenedianiline***, and then followed by ***5 grams of barbituric acid.*** Thereafter, blend the mixture at room temperature for about 10 minutes. Thereafter, add in ***360 grams of ammonium nitrate***, and then continue to blend the mixture at room temperature for about 1 hour. Thereafter, the mixture is ready for casting. To do so, the mixture should be poured and pressed into any desirable container, mold, ect., under mild pressure, and the following devices should then be cured in an oven at 60 to 70 Celsius for 96 hours. Thereafter, the mixture can be primed in the usual manner.
Burn rate: Moderate.
Combustion temperature: Low.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: *72.03% ammonium nitrate, 17.35% polyester binder, 8.6% diglycidyl ether, 1% 4,4'-methylenedianiline, 1% barbituric acid, 0.02% mixed balance*
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used for producing gas pressure for commercial and industrial uses. Can also be used in military applications for low pressure, low velocity systems such as grenade launchers, and smoke launchers.

06-03-021A: Gas generating composition for commercial and industrial applications:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***485 grams of guanidine nitrate***, followed by ***15 grams of copper-II-chloride anhydrous***, and then followed by ***5 grams of vanadium pentoxide***. Thereafter, tumble the mixture at 150 RPM for about 2 hours at room temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under a pressure of 15,000 psi in the usual manner. The mixture can be ignited using any electrical means.
Burn rate: 0.038 inches per second at 125 psi.
Combustion temperature: Low.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6

Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***96.03% guanidine nitrate, 2.97% copper-II-chloride, 0.99% vanadium pentoxide burn catalyst, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: used to produce large gas volumes for various operations.

Standard mortar shell

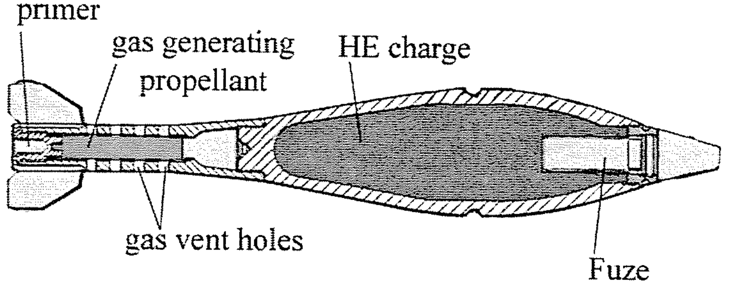


06-03-021B: Gas generating composition for commercial and industrial applications:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***450 grams of guanidine nitrate***, followed by ***50 grams of ammonium dichromate anhydrous***, followed by ***5 grams of copper-II-chloride anhydrous***, and then followed by ***5 grams of vanadium pentoxide***. Thereafter, tumble the mixture at 150 RPM for about 2 hours at room temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under a pressure of 15,000 psi in the usual manner. The mixture can be ignited using any electrical means.
Burn rate: 0.038 inches per second
Combustion temperature: Low.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***88.23% guanidine nitrate, 9.8% ammonium dichromate, 0.98% copper-II-chloride, 0.98% vanadium pentoxide burn catalyst, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: used to produce large gas volumes for various operations.

06-03-022A: Gas generating composition for military and industrial applications:
Into a suitable ball mill, or vertical mixer, containing some heavy Teflon coated lead shot, place ***248 grams of dolomite***, followed by ***338 grams of ammonium nitrate***, followed by ***20 grams of copper-II-oxalate***, and then followed by ***37 grams of ammonium dichromate***. Thereafter, tumble the mixture at 150 RPM for about 1 hour at room temperature. Thereafter, place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***320 grams of guanidine nitrate***, and then followed by ***38 grams of potassium nitrate***. Thereafter, add in 350 milliliters of ether or hexane, and then blend the mixture on moderate speed for about 45 minutes to form a uniform paste. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under a pressure of 10,000 psi in the usual manner and then allowed to cure, or the freshly prepared mixture can be placed onto a shallow pan or tray and allowed to thoroughly dry, and the resulting dry mass can be pulverized into a loose powder, which can be used directly in propellant bags/cartridges for propelling grenade and/or mortar shells. The mixture can be ignited using any means.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.76% ammonium nitrate, 31.96% guanidine nitrate, 24.77% dolomite, 3.79% potassium nitrate, 3.69% ammonium dichromate, 1.99% copper-II-oxalate, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used for generating gas pressure for propulsion purposes in military operations (grenade launchers, bazookas, mortars), or inflation devices for industrial applications.

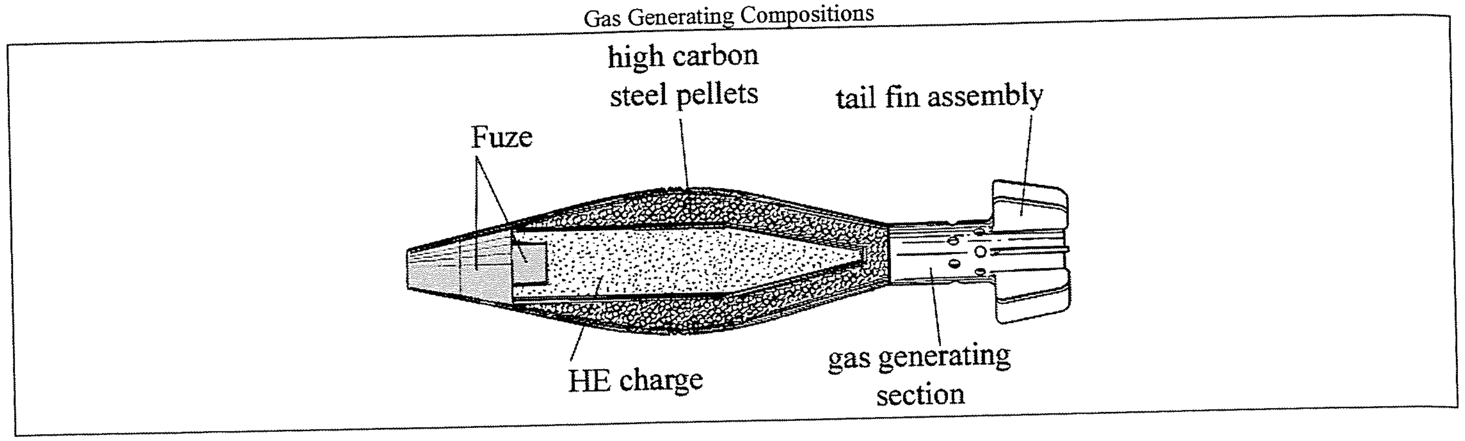
Mortar shell



06-03-022B: Gas generating composition for military and industrial applications:
Into a suitable ball mill, or vertical mixer, containing some heavy Teflon coated lead shot, place ***396 grams of dolomite***, followed by ***271 grams of ammonium nitrate***, followed by ***28 grams of ammonium dichromate***, and then followed by ***20 grams of copper-II-oxide***. Thereafter, tumble the mixture at 250 RPM for about 1 hour at room temperature. Thereafter, place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***256 grams of guanidine nitrate***, and then followed by ***28 grams of potassium nitrate***. Thereafter, add in 300 milliliters of ether or hexane, and then blend the mixture on moderate speed for about 45 minutes to form a uniform paste. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, rods, ect., under a pressure of 10,000 psi in the usual manner and then allowed to cure, or the freshly prepared mixture can be placed onto a shallow pan or tray and allowed to thoroughly dry, and the resulting dry mass can be pulverized into a loose powder, which can be used directly in propellant bags/cartridges for propelling grenade and/or mortar shells. The mixture can be ignited using any means.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.63% dolomite, 27.12% ammonium nitrate, 25.62% guanidine nitrate, 2.8% potassium nitrate, 2.8% ammonium dichromate, 2% copper-II-oxide, 0.03 residual balance.***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for generating gas pressure for propulsion purposes in military operations (grenade launchers, bazookas, mortars), or inflation devices for industrial applications.

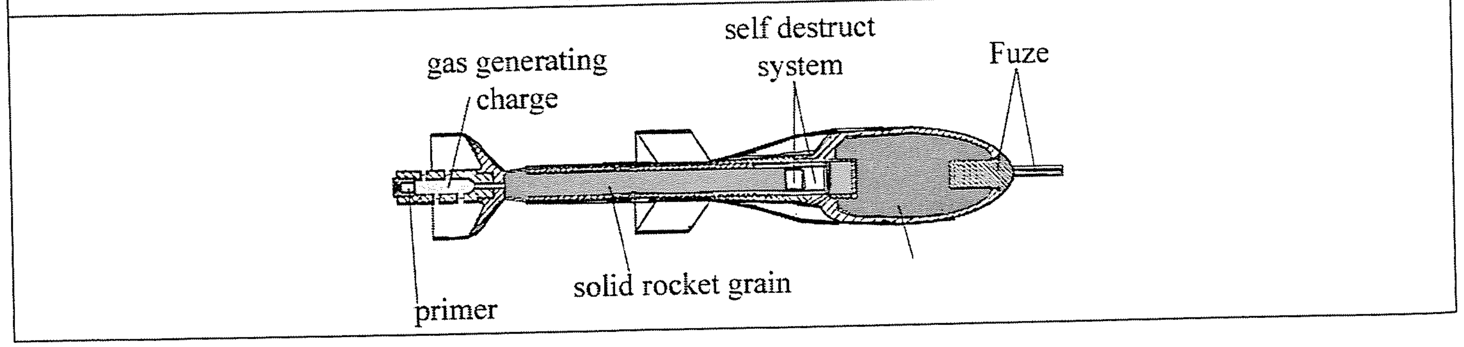
06-03-022C: Gas generating composition for military and industrial applications:
Into a suitable ball mill, or vertical mixer, equipped with motorized stirrer, place ***10 grams of copper-II-oxide***, followed by ***250 grams of magnesite***, followed by ***37 grams of ammonium dichromate***, followed by ***323 grams of guanidine nitrate***, followed by ***342 grams of ammonium nitrate***, and then followed by ***38 grams of potassium nitrate***. Thereafter, spray into the mill or mixer, 75 milliliters of 95% ethyl alcohol over a period of 1 hour while tumbling the mixture at 200 RPM. After the 1 hour tumbling process, the mixture is ready for use. To use, the mixture can be pressed under high pressure into tablets, pellets, rods, ect., under high pressure, or the mixture can be thoroughly dried, and then pulverized into a powder, and then this loose powder can be used in propellant bags/cartridges ect., in the usual manner.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***34.2% guanidine nitrate, 32.3% ammonium nitrate, 25% magnesite, 3.8% potassium nitrate, 3.7% ammonium dichromate, 1% copper-II-oxide***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for generating gas pressure for propulsion purposes in military operations (grenade launchers, bazookas, mortars), or inflation devices for industrial applications.

High lethality HE fragmenting mortar shell



06-03-023A: Gas generating composition for various applications:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***25 grams of Viton B fluoroelastomer binder***, and then add in 125 milliliters of ethyl acetate. Thereafter, blend the mixture to dissolve the binder. Thereafter, add in ***240 grams of potassium perchlorate***, followed by ***5 grams of graphite powder***, and then followed by ***230 grams of ground zirconium metal powder***. Thereafter, blend the mixture on high speed for about 1 hour. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly dry. Note: vacuum can applied to speed up the process. Thereafter, place the dried mass into a suitable ball mill or vertical mixer, and then tumble the mixture at 500 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., under the usual means.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48% potassium perchlorate, 46% zirconium metal, 5% Viton B binder, 1% graphite powder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as a gas generating composition for various applications.

Rocket assisted mortar shell



06-03-024A: Specialty "flameless" gas generating composition for industrial applications:
Into a suitable mixing bowl, equipped with motorized stirrer, place ***400 grams of guanidine nitrate***, and then followed by ***100 grams of calcium hypophosphite***. Thereafter, add in 100 milliliters of acetone, and then blend the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., under the usual means, and then cured in an oven at moderate temperature. The composition can be ignited using the usual means.
Burn rate: Below average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% guanidine nitrate, 20% calcium hypophosphite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as a gas generating composition for various applications.

06-03-024B: Specialty gas generating composition for industrial applications:
Into a suitable ball mill, or vertical mixer, place ***345 grams of nitrodicyandiamide***, followed by ***137.5 grams of ammonium nitrate***, and then followed by ***17.5 grams of ammonium hypophosphite***. Thereafter, tumble or rotate the mixture at 250 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., under high pressure. The composition can be ignited using the usual means.
Burn rate: Below average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***69% nitrodicyandiamide, 27.5% ammonium nitrate, 3.5% ammonium hypophosphite***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as a gas generating composition for various applications.

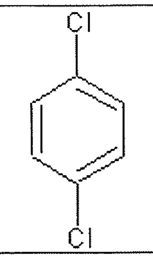
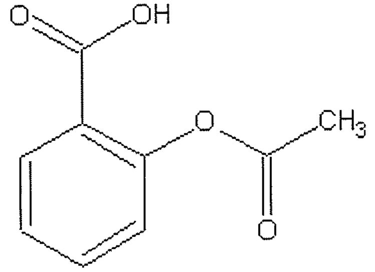
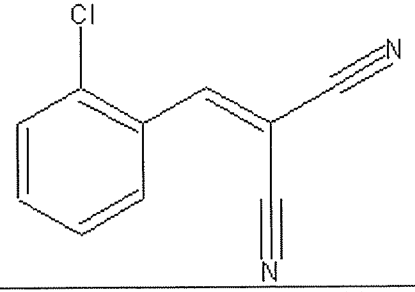
06-03-024C: Specialty gas generating composition for industrial applications:
Into a suitable ball mill, or vertical mixer, place ***260 grams of guanidine nitrate***, followed by ***65 grams of potassium nitrate***, and then followed by ***175 grams of ammonium hypophosphite***. Thereafter, tumble or rotate the mixture at 150 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 75 milliliters of hexane, and then blend the mixture for about 20 minutes to form a rough dough. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, ect., in the usual manner, and then cured in an oven at moderate temperature. The composition can be ignited using the usual means.
Burn rate: Below average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52% guanidine nitrate, 35% ammonium hypophosphite, 13% potassium nitrate***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used as a gas generating composition for various applications.

Section 4: Pyrotechnic Dissemination Compositions for Disseminating Chemical Agents, Pesticides, and Herbicides

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)	**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)	**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)	**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)	**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)	**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)	**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)	**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)	**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)	**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)	**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)	**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)	**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)	**129. Bismuth Subnitrate (see Smoke Generating Compositions)**
130. Calcium Iodate (see Smoke Generating Compositions)	**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)	**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)	**135. Potassium Ferricyanide (see Priming/Igniter Compositions)**
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)	**137. Bismuth Trioxide (see Priming/Igniter Compositions)**
138. Titanium powder (see Priming/Igniter Compositions)	**139. Tungsten powder (see Priming/Igniter Compositions)**
140. Lead Powder (see Priming/Igniter Compositions)	**141. Lead-II-Oxide (red lead; litharge) (see Priming/Igniter Compositions)**
142. Selenium powder (see Priming/Igniter Compositions)	**143. Sodium Bicarbonate (see Priming/Igniter Compositions)**

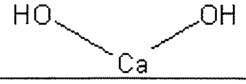
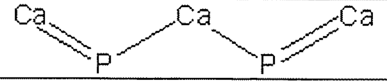
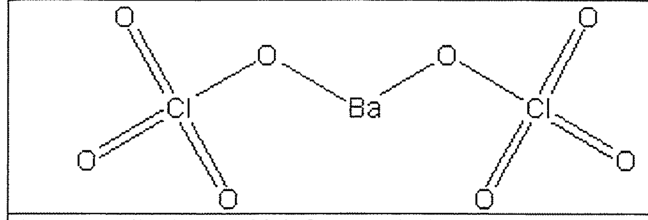
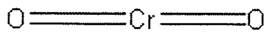
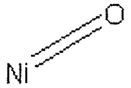
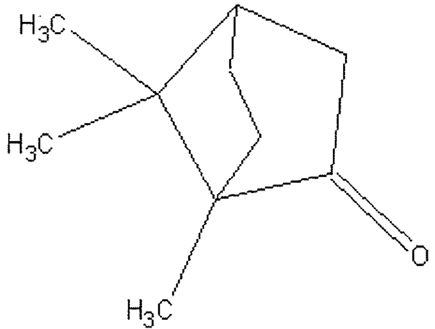
144. Iron powder (see Priming/Igniter Compositions)	**145. Silicon Dioxide (see Priming/Igniter Compositions)**
146. Lead Thiocyanate (see Priming/Igniter Compositions)	**147. Para-Nitrotoluene (see Priming/Igniter Compositions)**
148. Silver powder (see Priming/Igniter Compositions)	**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)	**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)	**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)	**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)	**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)	**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate (see Illumination/Flare and Signaling Compositions)	**161. Iodoform (see Illumination/Flare and Signaling Compositions)**
162. Lithium Nitrate (see Illumination/Flare and Signaling Compositions)	**163. Manganese Oxide (see Illumination/Flare and Signaling Compositions)**
164. Sodium Carbonate (see Illumination/Flare and Signaling Compositions)	**165. Molybdenum powder (see Illumination/Flare and Signaling Compositions)**
166. Sodium Oxalate (see Illumination/Flare and Signaling Compositions)	**167. Oxalic Acid (see Illumination/Flare and Signaling Compositions)**
168. Stearic acid (see Illumination/Flare and Signaling Compositions)	**169. Thorium Nitrate (see Illumination/Flare and Signaling Compositions)**
170. Cerium Nitrate (see Illumination/Flare and Signaling Compositions)	**171. Rubidium Nitrate (see Illumination/Flare and Signaling Compositions)**
172. Calcium metal (see Illumination/Flare and Signaling Compositions)	**173. Mercury-II-Chloride (see Illumination/Flare and Signaling Compositions)**
174. Zirconium Carbonate (see Illumination/Flare and Signaling Compositions)	**175. Barium Chloride (see Illumination/Flare and Signaling Compositions)**
176. Antimony powder (see Pyrotechnic Delay Compositions)	**177. Chromium metal (see Pyrotechnic Delay Compositions)**
178. Zinc powder (see Pyrotechnic Delay Compositions)	**179. Tin Dioxide (see Pyrotechnic Delay Compositions)**
180. Silver-I-Chromate (see Pyrotechnic Delay Compositions)	**181. Calcium Chromate (see Pyrotechnic Delay Compositions)**
182. Strontium Chromate (see Pyrotechnic Delay Compositions)	**183. Silver-I-Oxide (see Pyrotechnic Delay Compositions)**
184. Calcium Fluoride (see Pyrotechnic Delay Compositions)	**185. Paraffin (see Incendiary Compositions)**
186. Sodium Peroxide (see Incendiary Compositions)	**187. Metallic Lithium (see Incendiary Compositions)**
188. Calcium Carbide (see Incendiary Compositions)	**189. Ferrocene (see Incendiary Compositions)**
190. Lime (calcium oxide) (see Incendiary Compositions)	**191. Aluminum Oleate (see Incendiary Compositions)**
192. Aluminum Palmitate (see Incendiary Compositions)	**193. Zinc Stearate (see Incendiary Compositions)**
194. Silver Iodate (see Cloud Seeding Compositions)	**195. Silver-Chloride (see Cloud Seeding Compositions)**
196. Lead Acetate (see Cloud Seeding Compositions)	**197. Silver Nitrate (see Cloud Seeding Compositions)**
198. Polyethylene Glycol (see Cloud Seeding Compositions)	**199. Iodine Pentoxide (see Cloud Seeding Compositions)**
200. Nickel powder (see Pyrotechnic Welding Compositions)	**201. Tungsten Oxide (see Pyrotechnic Welding Compositions)**
202. Graphite (see Pyrotechnic Welding Compositions)	**203. Cobalt Oxide (see Pyrotechnic Welding Compositions)**
204. Chromium Trioxide (see Pyrotechnic Welding Compositions)	**205. Chromium-III-Oxide (see Pyrotechnic Welding Compositions)**
206. Cryolite (see Pyrotechnic Welding Compositions)	**207. Tin Oxide (see Pyrotechnic Welding Compositions)**
208. Calcium Fluoride (see Pyrotechnic Welding Compositions)	**209. Iron Tetraoxide (Ferrosoferric oxide) (see Pyrotechnic Welding Compositions)**
210. Sodium dichromate (see Pyrotechnic Welding Compositions)	**211. Sodium Silicate (see Pyrotechnic Welding Compositions)**
212. Copper hydroxide (see Gas Generating Compositions)	**213. Silicotungstic acid (see Gas Generating Compositions)**
214. Nickel Carbonate (see Gas Generating Compositions)	**215. Guanidine Nitrate (see Gas Generating Compositions)**
216. Cupric Oxalate (see Gas Generating Compositions)	**217. Calcium Cyanamide (see Gas Generating Compositions)**
218. Lead Thiocyanate (see Gas Generating Compositions)	**219. Calcium Formate (see Gas Generating Compositions)**
220. Sodium Formate (see Gas Generating Compositions)	**221. Magnesium Hydroxide (see Gas Generating**

	Compositions)
222. Tartaric Acid (see Gas Generating Compositions)	**223. Copper-II-Chloride (see Gas Generating Compositions)**
224. Ammonium Oxalate (see Gas Generating Compositions)	**225. Calcium Hypophosphite (see Gas Generating Compositions)**
226. Ammonium Hypophosphite (see Gas Generating Compositions)	**227. para-Dichlorobenzene**
	
	Forms colorless volatile crystals that have a peculiar odor. The crystals melt when heated to 54 Celsius. The crystals are insoluble in water, but soluble in alcohol, benzene, chloroform, and ether. Urinal cakes are composed of 99% para-Dichlorobenzene.
228. Aspirin	**229. CS Riot Control Agent**
	
Forms white crystals, tablets, needles, or powder. The crystals slowly oxidize when allowed to stand in moist air for prolonged periods. Aspirin has a melting point of 135 Celsius when rapidly heated, but solidifies thereafter, with decomposition beginning at higher temperatures. Aspirin is flammable and will burn producing a choking smoke. The crystals are slightly soluble in water, but are soluble in alcohol.	CS forms a white crystalline solid with a melting point of 95 Celsius. It has a pepper like smell in crystalline form, and an intense pungent odor when in vapor form. It can be distilled at 310 Celsius under standard atmospheric pressure. CS is only very slightly soluble in water, but soluble in acetone, dioxane, methylene chloride, and ethyl acetate.
	Method of Preparation 1: Into a suitable flask, place 1870 grams of methanol, followed by 230 grams of malononitrile, and then 500 grams of o-chlorobenzaldehyde. Thereafter, gently heat the mixture to 40 Celsius, while moderately stirring. When the temperature of the reaction mixture reaches 40 Celsius, carefully add 800 milligrams of piperidine, and then raise the temperature to 50 Celsius. Thereafter, heat the mixture at 50 Celsius with stirring for about 1 hour. After 1 hour, remove the heat source and allow the reaction mixture to cool to room temperature. Then filter the reaction mixture to recover the precipitated CS crystals, and then wash these recovered crystals with two 100-gram portions of fresh methanol. Then vacuum dry or air-dry the CS crystals. Note: these methanol washing portions can be added to the filtered reaction mixture, and this resulting filtered reaction mixture can be used in a second formation of CS, when using the same ingredients as just described (230 grams of malonitrile/500 grams of o-chlorobenzaldehyde; followed by 800 milligrams of piperidine catalyst; under the same conditions). The resulting dried CS crystals should then be stored in a cool dry place until use.

Section 5: Miscellaneous Pyrotechnic Compositions

Chemicals used in this section (binders are not included)

1. Potassium nitrate (see Black Powder)	**2. Sulfur (see Black Powder)**
3. Charcoal (see Black Powder)	**4. Sugar Carbon (see Modified Black Powder)**
5. Barium Chromate (see Modified Black Powder)	**6. Potassium Perchlorate (see Modified Black Powder)**
7. Potassium Dichromate (see Modified Black Powder)	**8. Ammonium Bisulfide (see Modified Black Powder)**
9. Potassium chlorate (see Modified Black Powder)	**10. Carbon Disulfide (see Modified Black Powder)**
11. Nitrocellulose (see Modified Black Powder)	**12. Lead Tetraoxide (see Modified Black Powder)**
13. Diphenylamine (see Modified Black Powder)	**14. Titanium Dioxide (see Modified Black Powder)**
15. Manganese Dioxide (see Modified Black Powder)	**16. Sodium Benzoate (see Modified Black Powder)**
17. Ammonium Nitrate (see Modified Black Powder)	**18. Calcium Carbonate (see Modified Black Powder)**
19. Sodium Nitrate (see Modified Black Powder)	**20. Urea (see Modified Black Powder)**
21. Lead Nitrate (see Modified Black Powder)	**22. Nitro Starch (see Modified Black Powder)**
23. Ammonium Perchlorate (see Ammonium Perchlorate Rocket Propellants)	**24. Aluminum powder (see Ammonium Perchlorate Rocket Propellants)**
25. Magnesium Sulfide (see Ammonium Perchlorate Rocket Propellants)	**26. Copper Chromite (see Ammonium Perchlorate Rocket Propellants)**
27. Nitroguanidine (see Ammonium Perchlorate Rocket Propellants)	**28. Ammonium Sulfate (see Ammonium Perchlorate Rocket Propellants)**
29. Nitroglycerine (see Ammonium Perchlorate Rocket Propellants)	**30. Magnesium Oxide (see Ammonium Perchlorate Rocket Propellants)**
31. Iron-II-oxide (see Ammonium Perchlorate Rocket Propellants)	**32. Zirconium Hydride (see Ammonium Perchlorate Rocket Propellants)**
33. Teflon (see Ammonium Perchlorate Rocket Propellants)	**34. Zinc Oxide (see Ammonium Perchlorate Rocket Propellants)**
35. Ammonium Dichromate (see Ammonium Perchlorate Rocket Propellants)	**36. Lithium Perchlorate (see Ammonium Perchlorate Rocket Propellants)**
37. Magnesium powder (see Ammonium Perchlorate Rocket Propellants)	**38. Lithium Aluminum Hydride (see Ammonium Perchlorate Rocket Propellants)**
39. Iron-III-oxide (red iron oxide) (see Ammonium Perchlorate Rocket Propellants)	**40. PVC (see Ammonium Perchlorate Rocket Propellants)**
41. Copper Sulfide (see Ammonium Perchlorate Rocket Propellants)	**42. Sodium Hydride (see Ammonium Perchlorate Rocket Propellants)**
43. Titanium Hydride (see Ammonium Perchlorate Rocket Propellants)	**44. Silicon Nitride (see Ammonium Perchlorate Rocket Propellants)**
45. ADN (see ADN Rocket Propellants)	**46. Urea Nitrate (see ADN Rocket Propellants)**
47. Silicon Powder (see ADN Rocket Propellants)	**48. Hexamine (see ADN Rocket Propellants)**
49. Boron powder (see ADN Rocket Propellants)	**50. Sodium hypophosphite (see ADN Rocket Propellants)**
51. KDN (see ADN Rocket Propellants)	**52. Nickel Chloride (see Ammonium Nitrate Rocket Propellants)**
53. TNT (see Ammonium Nitrate Rocket Propellants)	**54. Acrylamide (see Miscellaneous Rocket H.P. Rocket Propellants)**
55. Ethylene Glycol (see Miscellaneous Rocket H.P. Rocket Propellants)	**56. Magnesium Perchlorate (see Miscellaneous Rocket H.P. Rocket Propellants)**
57. Metallic Lithium (see Miscellaneous Rocket H.P. Rocket Propellants)	**58. Beryllium Hydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
59. Red Phosphorus (see Miscellaneous Rocket H.P. Rocket Propellants)	**60. Sodium Borohydride (see Miscellaneous Rocket H.P. Rocket Propellants)**
61. Sodium chlorate (see Miscellaneous Rocket H.P. Rocket Propellants)	**62. Lead Dioxide (see Miscellaneous Rocket H.P. Rocket Propellants)**
63. Benzoyl Peroxide (see Miscellaneous Rocket H.P. Rocket Propellants)	**64. Barium Nitrate (see Miscellaneous Rocket H.P. Rocket Propellants)**
65. Cyanuric Acid (see Miscellaneous Rocket H.P. Rocket Propellants)	**66. Aluminum Stearate (see Ammonium Nitrate Gun Propellants)**
67. Aluminum Hydride (see Ammonium Nitrate Gun Propellants)	**68. Magnesium Peroxide (see Ammonium Nitrate Gun Propellants)**
69. Potassium Permanganate (see Ammonium Nitrate Gun Propellants)	**70. Calcium Hydride (see Ammonium Nitrate Gun Propellants)**
71. Potassium Tartrate (see Ammonium Nitrate Gun Propellants)	**72. Potassium Ferrocyanide (see Ammonium Nitrate Gun Propellants)**
73. Sodium Azide (see Ammonium Nitrate Gun Propellants)	**74. Sodium Chloride (see Ammonium Nitrate Gun Propellants)**
75. Potassium Sulfate (see Nitrocellulose Gun Propellants)	**76. Lead Stearate (see Nitrocellulose Gun Propellants)**
77. Triethylene Glycol (see Nitrocellulose Gun Propellants)	**78. Sugar (sucrose) (see Miscellaneous Gun Propellants)**
79. Sodium Propionate (see Miscellaneous Gun Propellants)	**80. Picric Acid (see Miscellaneous Gun Propellants)**
81. Copper-II-oxide (see Miscellaneous Gun Propellants)	**82. Ammonium Picrate (see Miscellaneous Gun Propellants)**
83. Barium Peroxide (see Bullet Tracer Compositions)	**84. Magnesium Carbonate (see Bullet Tracer Compositions)**
85. Strontium Peroxide (see Bullet Tracer Compositions)	**86. Strontium Nitrate (see Bullet Tracer Compositions)**
87. Cupric chloride (see Bullet Tracer Compositions)	**88. Hexachlorobenzene (see Bullet Tracer Compositions)**
89. Strontium oxalate (see Bullet Tracer Compositions)	**90. Mercury-I-Chloride (see Bullet Tracer Compositions)**
91. Zinc Oxalate (see Bullet Tracer Compositions)	**92. Zinc Chloride (see Bullet Tracer Compositions)**
93. Uranium (see Bullet Tracer Compositions)	**94. Zirconium nitrate (see Bullet Tracer Compositions)**
95. Yttrium Nitrate (see Bullet Tracer Compositions)	**96. Yttrium Oxide (see Bullet Tracer Compositions)**
97. Zirconium Oxide (see Bullet Tracer Compositions)	**98. Cerium Oxide (see Bullet Tracer Compositions)**
99. Hexachloroethane (see Bullet Tracer Compositions)	**100. Antimony trisulfide (see Bullet Tracer Compositions)**
101. Anthracene (see Bullet Tracer Compositions)	**102. Phosphorus Sesquisulphide (see Match Compositions)**
103. Boric acid (see Match Compositions)	**104. Aluminum Hydroxide (see Match Compositions)**
105. Antimony Pentasulfide (see Match Compositions)	**106. Glucose (see Match Compositions)**
107. Sodium Hydroxide (see Match Compositions)	**108. Lead Hypophosphite (see Match Compositions)**
109. Calcium Sulfate (see Match Compositions)	**110. Ammonium Chloride (see Smoke Generating Compositions)**
111. Manganese (see Smoke Generating Compositions)	**112. Lactose (see Smoke Generating Compositions)**
113. Propylene Glycol (see Smoke Generating Compositions)	**114. Glycerol (see Smoke Generating Compositions)**
115. Potassium Chloride (see Smoke Generating Compositions)	**116. Potassium Bicarbonate (see Smoke Generating Compositions)**
117. Dicyanodiamide (see Smoke Generating Compositions)	**118. Naphthalene (see Smoke Generating Compositions)**
119. Thiourea (see Smoke Generating Compositions)	**120. Phthalic Anhydride (see Smoke Generating Compositions)**
122. Cadmium powder (see Smoke Generating Compositions)	**123. Cadmium Sulfide (see Smoke Generating Compositions)**
124. Melamine (see Smoke Generating Compositions)	**125. Malic Acid (see Smoke Generating Compositions)**
126. Calcium Lactate (see Smoke Generating Compositions)	**127. Metallic Sodium (see Smoke Generating Compositions)**
128. Bismuth Tetraoxide (see Smoke Generating Compositions)	**129. Bismuth Subnitrate (see Smoke Generating Compositions)**
130. Calcium Iodate (see Smoke Generating Compositions)	**131. Potassium Iodate (see Smoke Generating Compositions)**
132. Magnesium Chloride (see Smoke Generating Compositions)	**133. Para-Nitroaniline (see Smoke Generating Compositions)**
134. Iodine (see Smoke Generating Compositions)	**135. Potassium Ferricyanide (see Priming/Igniter Compositions)**
136. Potassium hexacyanocobaltate (see Priming/Igniter Compositions)	**137. Bismuth Trioxide (see Priming/Igniter Compositions)**
138. Titanium powder (see Priming/Igniter Compositions)	**139. Tungsten powder (see Priming/Igniter Compositions)**
140. Lead Powder (see Priming/Igniter Compositions)	**141. Lead-II-Oxide (red lead; lithrage) (see Priming/Igniter Compositions)**
142. Selenium powder (see Priming/Igniter Compositions)	**143. Sodium Bicarbonate (see Priming/Igniter Compositions)**
144. Iron powder (see Priming/Igniter Compositions)	**145. Silicon Dioxide (see Priming/Igniter Compositions)**
146. Lead Thiocyanate (see Priming/Igniter Compositions)	**147. Para-Nitrotoluene (see Priming/Igniter Compositions)**

148. Silver powder (see Priming/Igniter Compositions)	**149. Sodium Tungstate (see Priming/Igniter Compositions)**
150. Zirconium powder (see Priming/Igniter Compositions)	**151. Bismuth powder (see Priming/Igniter Compositions)**
152. Copper-I-oxide (see Priming/Igniter Compositions)	**153. Lead Styphnate (see Priming/Igniter Compositions)**
154. Tellurium Dioxide (see Priming/Igniter Compositions)	**155. Tetracene (see Priming/Igniter Compositions)**
156. Iron Sulfide (see Priming/Igniter Compositions)	**157. Zinc Phosphide (see Priming/Igniter Compositions)**
158. Copper powder (see Priming/Igniter Compositions)	**159. Hafnium powder (see Priming/Igniter Compositions)**
160. Cesium Nitrate (see Illumination/Flare and Signaling Compositions)	**161. Iodoform (see Illumination/Flare and Signaling Compositions)**
162. Lithium Nitrate (see Illumination/Flare and Signaling Compositions)	**163. Manganese Oxide (see Illumination/Flare and Signaling Compositions)**
164. Sodium Carbonate (see Illumination/Flare and Signaling Compositions)	**165. Molybdenum powder (see Illumination/Flare and Signaling Compositions)**
166. Sodium Oxalate (see Illumination/Flare and Signaling Compositions)	**167. Oxalic Acid (see Illumination/Flare and Signaling Compositions)**
168. Stearic acid (see Illumination/Flare and Signaling Compositions)	**169. Thorium Nitrate (see Illumination/Flare and Signaling Compositions)**
170. Cerium Nitrate (see Illumination/Flare and Signaling Compositions)	**171. Rubidium Nitrate (see Illumination/Flare and Signaling Compositions)**
172. Calcium metal (see Illumination/Flare and Signaling Compositions)	**173. Mercury-II-Chloride (see Illumination/Flare and Signaling Compositions)**
174. Zirconium Carbonate (see Illumination/Flare and Signaling Compositions)	**175. Barium Chloride (see Illumination/Flare and Signaling Compositions)**
176. Antimony powder (see Pyrotechnic Delay Compositions)	**177. Chromium metal (see Pyrotechnic Delay Compositions)**
178. Zinc powder (see Pyrotechnic Delay Compositions)	**179. Tin Dioxide (see Pyrotechnic Delay Compositions)**
180. Silver-I-Chromate (see Pyrotechnic Delay Compositions)	**181. Calcium Chromate (see Pyrotechnic Delay Compositions)**
182. Strontium Chromate (see Pyrotechnic Delay Compositions)	**183. Silver-I-Oxide (see Pyrotechnic Delay Compositions)**
184. Calcium Fluoride (see Pyrotechnic Delay Compositions)	**185. Paraffin (see Incendiary Compositions)**
186. Sodium Peroxide (see Incendiary Compositions)	**187. Metallic Lithium (see Incendiary Compositions)**
188. Calcium Carbide (see Incendiary Compositions)	**189. Ferrocene (see Incendiary Compositions)**
190. Lime (calcium oxide) (see Incendiary Compositions)	**191. Aluminum Oleate (see Incendiary Compositions)**
192. Aluminum Palmitate (see Incendiary Compositions)	**193. Zinc Stearate (see Incendiary Compositions)**
194. Silver Iodate (see Cloud Seeding Compositions)	**195. Silver-Chloride (see Cloud Seeding Compositions)**
196. Lead Acetate (see Cloud Seeding Compositions)	**197. Silver Nitrate (see Cloud Seeding Compositions)**
198. Polyethylene Glycol (see Cloud Seeding Compositions)	**199. Iodine Pentoxide (see Cloud Seeding Compositions)**
200. Nickel powder (see Pyrotechnic Welding Compositions)	**201. Tungsten Oxide (see Pyrotechnic Welding Compositions)**
202. Graphite (see Pyrotechnic Welding Compositions)	**203. Cobalt Oxide (see Pyrotechnic Welding Compositions)**
204. Chromium Trioxide (see Pyrotechnic Welding Compositions)	**205. Chromium-III-Oxide (see Pyrotechnic Welding Compositions)**
206. Cryolite (see Pyrotechnic Welding Compositions)	**207. Tin Oxide (see Pyrotechnic Welding Compositions)**
208. Calcium Fluoride (see Pyrotechnic Welding Compositions)	**209. Iron Tetraoxide (Ferrosoferric oxide) (see Pyrotechnic Welding Compositions)**
210. Sodium dichromate (see Pyrotechnic Welding Compositions)	**211. Sodium Silicate (see Pyrotechnic Welding Compositions)**
212. Copper hydroxide (see Gas Generating Compositions)	**213. Silicotungstic acid (see Gas Generating Compositions)**
214. Nickel Carbonate (see Gas Generating Compositions)	**215. Guanidine Nitrate (see Gas Generating Compositions)**
216. Cupric Oxalate (see Gas Generating Compositions)	**217. Calcium Cyanamide (see Gas Generating Compositions)**
218. Lead Thiocyanate (see Gas Generating Compositions)	**219. Calcium Formate (see Gas Generating Compositions)**
220. Sodium Formate (see Gas Generating Compositions)	**221. Magnesium Hydroxide (see Gas Generating Compositions)**
222. Tartaric Acid (see Gas Generating Compositions)	**223. Copper-II-Chloride (see Gas Generating Compositions)**
224. Ammonium Oxalate (see Gas Generating Compositions)	**225. Calcium Hypophospite (see Gas Generating Compositions)**
226. Ammonium Hypophosphite (see Gas Generating Compositions)	**227. para-Dichlorobenzene (see Pyrotechnic Dissemination Compositions)**
228. Aspirin (see Pyrotechnic Dissemination Compositions)	**229. CS Riot Control Agent (see Pyrotechnic Dissemination Compositions)**
230. Cinnamic acid (see Pyrotechnic Dissemination Compositions)	**231. Mercury Sulfide (cinnabar) (see Pyrotechnic Dissemination Compositions)**
232. Semicarbazide (see Pyrotechnic Dissemination Compositions)	**233. Maleic Anhydride (see Pyrotechnic Dissemination Compositions)**
234. Calcium Hydroxide	**235. Calcium Phosphide**
	
Forms a white fluffy powder or masses. The powder decomposes when heated forming calcium oxide. Calcium hydroxide dissolves in acids, but is insoluble in water and all known solvents.	Forms a reddish-brown crystalline powder, or dark gray lumps. The crystals decompose in moist air forming the dangerous gas phosphine. Keep stored in airtight bottles in a dry place.
236. Barium Perchlorate	**237. Chromium Dioxide**
	
Forms a trihydrate, which forms colorless crystals, or white granules or powder. The crystals are readily soluble in water. Barium perchlorate is toxic, so users should avoid skin contact, or inhalation of dust.	Forms a black crystalline mass, or blackish-gray granules or lumps. The impure product may be discolored with a slight tinge. Is somewhat stable at room temperature, but slowly converted to dichromium trioxide. The powder is insoluble in water and the usual solvents. Slowly dissolves in mineral acids.
238. Nickel Oxide	**239. Camphor**
	
Forms a green powder, which turns yellow when heated. The powder is insoluble in water and alcohol, but soluble in mineral acids. Slowly dissolves in alkali hydroxide solutions.	Forms a beautiful translucent crystalline mass. The crystals have a melting point of 180 Celsius. The crystals tend to sublime on standing, or upon heating. The crystals are insoluble in water, but freely soluble in alcohol, ether, methylene chloride, or acetone.

- Miscellaneous Pyrotechnic Compositions in this section -

1. 06-05-001A: Deflagrating composition for underwater seismic surveying with non-damaging effects upon marine life: *47.3% sodium nitrate, 28.6% potassium perchlorate, 15.4% aluminum, 7.9% sulfur, 0.66% starch, 0.14% impurities*	**2. 06-05-002A: "Flash" powder for use in photography (year 1898):** *60% potassium perchlorate, 40% aluminum*
3. 06-05-003A: Anti-infrared and anti-laser smoke producing pyrotechnic charge: *95% red phosphorus, 5% styrene rubber binder*	**4. 06-05-004A: Infrared radiating pyrotechnic composition for use in flares, and other munitions for intercepting or distracting infrared guided weapons (MTV decoy):** *54.4% PMF binder, 39.6% magnesium, 4.9% VITON.RTM*

	copolymer binder, 0.99% graphite, 0.11% residue
5. 06-05-005A: Water reactive pyrophoric composition that ignites in contact with water producing high temperature flame: *92.1% calcium carbide, 7.6% metallic sodium, 0.16% residue, 0.14% oleic acid*	**6. 06-05-006A: Reactive non-pyrophoric "jelly" composition that may ignite in contact with water:** *32.5% standard heating oil, 32.5% petrol, 20% calcium carbide, 5% metallic sodium, 5% silicon dioxide, 5% polystyrene*
7. 06-05-007A: Reactive non-pyrophoric "jelly" composition capable of igniting in contact with water (modified): *20% potassium nitrate, 20% dark pyrogenic aluminum, 20% sodium nitrate, 13% petrol, 13% standard heating oil, 8% calcium carbide, 2% silicon dioxide, 2% polystyrene, 2% metallic sodium*	**8. 06-05-008A: Reactive non-pyrophoric dry composition capable of igniting in contact with water:** *80% calcium carbide, 17% metallic sodium, 3% lubricating oil*
9. 06-05-009A: Re-ignitable match composition: *40.7% potassium chlorate, 39.8% polymethyl methacrylate binder, 4.4% manganese dioxide catalyst, 4.4% polyoxymethylene burn modifier, 3.5% silica burn modifier, 3.5% corn starch filler, 3.5% ammonium dichromate quenching agent, 0.20% residue*	**10. 06-05-010A: "Flash light" pyrotechnic composition producing high intensity actinic light:** *59% magnesium, 35.4% cerium oxide, 3.6% epoxy resin, 1.8% vanadic acid 0.20% mixed impurities*
11. 06-05-010B: "Flash light" pyrotechnic composition producing high intensity actinic light (modified): *68.3% magnesium, 13.6% cerium oxide, 13.6% calcium hydroxide, 4.2% epoxy resin, 0.3% mixed impurities*	**12. 06-05-011A: Flash powder for photography (early 20th century):** *50% sodium tungstate, 50% magnesium*
13. 06-05-012A: Flash powder for photography and illuminating purposes (mid 20th century): *75% magnesium, 25% sodium nitrate*	**14. 06-05-013A: Water reactive pyrotechnic composition for generating heat, gas, and flame upon contact with water:** *33.33% zinc, 33.33% ammonium chloride, 33.33% ammonium nitrate, 0.01% balance*
15. 06-05-013B: Water reactive pyrotechnic composition for generating heat, gas, and flame upon contact with water (with increased stability): *47% ammonium nitrate, 30% zinc, 20% ammonium chloride, 3% PVC molding powder*	**16. 06-05-014A: Magnesium fuel for ramjet projectiles:** *83% magnesium, 9% sodium nitrate, 8% rubber cement*
17. 06-05-014B: Magnesium fuel for ramjet projectiles (with burn modifier): *89% magnesium, 6% sodium nitrate, 3% stearic acid, 2% rubber cement*	**18. 06-05-015A: Specialty incendiary composition that ignites violently upon contact with water:** *91.4% magnesium, 5.7% calcium phosphide, 2.85% potassium perchlorate, 0.05% balance*
19. 06-05-016A: Reduced wake propellant composition for propelling torpedoes: *46.7% potassium perchlorate, 29% cobalt, 24.1% aluminum, 0.2% balance*	**20. 06-05-016B: Reduced wake propellant composition for propelling torpedoes (modified):** *56.3% potassium perchlorate, 29% copper, 14.6% beryllium metal, 0.1% balance*
21. 06-05-016C: Reduced wake propellant composition for propelling torpedoes (modified 2): *38.4% lithium perchlorate, 31.9% magnesium, 29.6% tin metal, 0.10% balance*	**22. 06-05-017A: Pyrophoric water reactive incendiary composition for starting oil slick fires and catching flammable liquids with water on fire:** *67.95% magnesium, 14.6% calcium carbide, 14.6% iron-III-oxide, 2.83% asphalt, 0.05% balance*
23. 06-05-018A: Friction sensitive pyrophoric composition for self-lighting cigars: *45% potassium chlorate, 27% carbon black, 8% gum acacia, 8% starch, 6% ground silica, 6% manganese dioxide*	**24. 06-05-019A: Flashlight composition for various uses:** *54.54% potassium chlorate, 45.45% magnesium powder, 0.01% pyroxylin*
25. 06-05-020A: High temperature resistant ignition composition activated by laser: *88.4% tellurium dioxide, 6.6% boron powder, 5% Viton B binder*	**26. 06-05-021A: Red flash powder for various uses:** *64% strontium nitrate, 16% aluminum powder, 8% magnesium powder, 6.4% sodium oxalate, 5.6% red phosphorus*
27. 06-05-022A: Flash light powder for various uses: *67.51% magnesium powder, 12% magnesia, 10.5% potassium permanganate, 6.37% potassium nitrate, 2.25% soft wood charcoal, 1.35% sulfur, 0.02% mixed residual balance*	**28. 06-05-022B: Flash light powder for various uses:** *53.03% magnesium powder, 21.21% calcium carbonate, 12.12% aluminum powder, 9.09% silicon dioxide, 4.54% magnesia, 0.01% mixed balance*
29. 06-05-022C: Flash light powder for various uses: *52.84% magnesium powder, 20.32% ground alabaster, 12.19% aluminum powder, 9.75% silicon dioxide, 4.87% magnesia, 0.03% residual balance*	**30. 06-05-023A: Heat producing pyrotechnic composition for starting campfires:** *32.96% ground pumice, 21.97% Kaolin, 16.48% aluminum powder, 10.98% ground brass, 8.24% potassium chlorate, 5.49% copper-II-oxide, 3.29% para-toluene sulfonic acid, 0.54% linseed oil, 0.05% residual balance*
31. 06-05-023B: Heat producing pyrotechnic composition for starting campfires: *34.88% pumice, 23.25% Kaolin, 23.25%*	**32. 06-05-024A: Reduced wake propellant composition for underwater torpedoes:** *47.54% metallic sodium, 43.36%*

powdered aluminum, 8.72% potassium chlorate, 5.81% copper-I-oxide, 3.48% benzene sulfonic acid, 0.58% mineral oil, 0.03% mixed balance	*barium perchlorate, 9.09% chromium dioxide burn catalyst, 0.01% residual balance*
33. 06-05-024B: Reduced wake propellant composition for underwater torpedoes: *56.09% potassium permanganate, 34.81% zinc powder, 9.09% nickel oxide, 0.01% mixed balance*	**34. 06-05-025A: Specialty friction sensitive composition for making re-ignitable matchsticks:** *49.61% nitrocellulose, 15.26% potassium chlorate, 11.45% powdered glass, 10.68% camphor, 7.63% zinc dust, 1.9% potassium dichromate, 1.9% sulfur, 1.52% ammonium oxalate, 0.05% balance*
35. 06-05-025B: Specialty friction sensitive composition for making re-ignitable matchsticks: *33% acetyl cellulose, 22% potassium chlorate, 15% nitrocellulose, 10% powdered glass, 7% hexamine, 6% sulfur, 4% ammonium oxalate, 3% camphor*	

06-05-001A: Deflagrating composition for underwater seismic surveying with non-damaging effects upon marine life:
Into a suitable mixing bowl or blender, equipped with a plastic stir blade, place 150 milliliters of hexane, followed by ***36 grams of flours of sulfur,*** followed by ***3 grams of food grade starch,*** followed by ***70 grams of standard powdered aluminum,*** and then rapidly blend the mixture for about 30 minutes to form a uniform pasty mass. After stirring for 30 minutes, add in 50 milliliters of additional hexane, followed by ***215 grams of sodium nitrate*** followed by ***130 grams of potassium perchlorate,*** and then continue to rapidly blend the mixture on high until nearly all the hexane has evaporated and small granules of the composition remain. Thereafter, the composition is ready for use. To use, it should be loosely placed into any desirable container or tube. Note: the granules need not be separated into their identical grain sizes. Second note: the granules can be stored in plastic bags until use.
Note: for best results, a standard RDX blasting cap should be used for initiation.
Burn rate: Deflagrates when initiated by blasting cap, but pressure output is similar to 450 meters per second
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 only when initiated by blasting cap.
Ease of ignition (1 to 10): 9 only when initiated by blasting cap.
Tendency to cake: None.
Explosive ability: Moderate.
Percentage: ***47.3% sodium nitrate, 28.6% potassium perchlorate, 15.4% aluminum, 7.9% sulfur, 0.66% starch, 0.14% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in seismic survey chargers for underwater use.

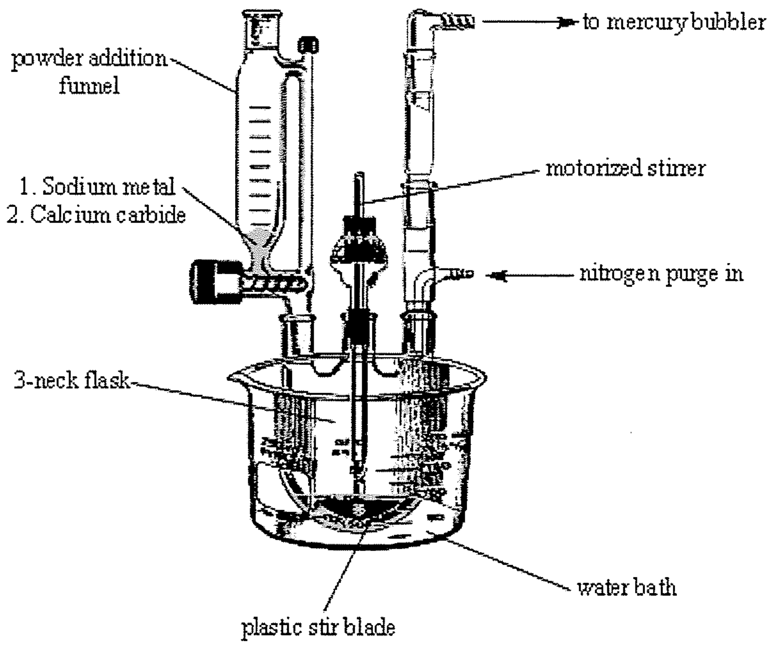
06-05-002A: "Flash" powder for use in photography (year 1898):
Into a suitable mixing bowl, or mortar and pestle, place 150 milliliters of 95% ethyl alcohol, followed by ***300 grams of potassium perchlorate,*** followed by ***200 grams of standard powdered aluminum*** (150 to 300 mesh), and then rapidly but gently blend the mixture for about 1 hour using a wooden spatula to form a uniform fluidized pasty mass. After stirring for 1 hour, the mixture is ready to be used. To do so, it should be placed onto a shallow tray and allowed to thoroughly air-dry. Once it has, it needs to be gently pulverized using a wooden article in a mortar and pestle until a fine powder is obtained.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Moderate.
Percentage: ***60% potassium perchlorate, 40% aluminum***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Was formerly used in photography, but can be used in fireworks or flash photography.

06-05-003A: Anti-infrared and anti-laser smoke producing pyrotechnic charge:
Into a suitable beaker or similar container, place 50 milliliters of methylene chloride, and then add in and dissolve ***25 grams of a carbon-containing styrene-butadiene rubber*** containing 9% carbon black filler (INCARB 5609, available from International Synthetic Rubber Company Limited). Note: If the rubber compound fails to fully dissolve, add in some more methylene chloride until it does. Thereafter, add in ***475 grams of red amorphous phosphorus***, and then blend the mixture using a standard motorized stirrer equipped with Teflon coated blade until the bulk of the methylene chloride has evaporated. Thereafter, place the pasty mass onto a shallow pan and allow it to thoroughly air-dry. Once it has, simply pulverize it using a metal spatula or ball mill, and then press the dried pulverized mixture into any desirable container, tube, or mold. To use the mixture, it needs to be detonated using a small TNT charge. Note: In most cases, to protect vehicles, tanks, ect, from air fired weapons, the munition body should be ejected upwards and

over the vehicle, tank, ect., (to be masked), using any suitable low velocity gun propellant, and then detonated over said vehicle, tank, ect, at an altitude of 2 to 12 meters to maximize smoke concealment to properly mask the vehicle, tank, ect.
Burn rate: N/A.
Masking time: Sample of 500+ grams of or so can provide 30 seconds of masking over a vehicle or tank.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***95% red phosphorus, 5% styrene rubber binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to temporarily mask targets from infrared-guided munitions, and laser guided munitions.

06-05-004A: Infrared radiating pyrotechnic composition for use in flares, and other munitions for intercepting or distracting infrared-guided weapons (MTV decoy):
Into a suitable mixing bowl, blender, or similar device, equipped with motorized stirrer utilizing a plastic stir blade, place ***275 grams of poly-(carbon monofluoride) (PMF),*** which is a graphite fluorinated polymer, followed by ***200 grams of standard powdered magnesium***, followed by ***25 grams of VITON.RTM***, which is a fluoroelastomer based on the copolymer of vinylidene fluoride and hexafluoropropylene (commercially available), followed by ***5 grams of graphite powder***, and then add in 1000 milliliters of acetone. Thereafter, moderately blend the mixture until the bulk of the acetone has evaporated, and only a mild pasty mass remains. Thereafter, place the pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Note: placing the mass on a shallow pan and drying in an oven ay 40 Celsius for about 5 hours can speed up the drying process. Thereafter, place the dry mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture for about 1 hour at about 150 RPM. Thereafter, the mixture should be pressed into 25 millimeter in diameter pellets of about 40-gram weight per pellet. These pellets can then be used to fill any desirable container, flare body, tube, ect. Note: this means do not press the 40-gram pellets into your desired container, and the 40-gram pellets should be placed loosely into the desirable container. A proper igniter composition should be used for initiation.
Burn rate: About 3 seconds per 40-gram sample.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54.4% PMF binder, 39.6% magnesium, 4.9% VITON.RTM copolymer binder, 0.99% graphite, 0.11% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in flares and similar devices to counter measure against infrared guided missiles, or to temporarily mask (by distraction) targets from infrared-guided munitions.

06-05-005A: Water reactive pyrophoric composition that ignites in contact with water producing high temperature flame:
Into a suitable single neck flask equipped with nitrogen gas inlet tube, powder addition funnel, and motorized stirrer utilizing plastic stir blade, place 160 grams of dry light lubricating mineral oil, followed by ***80 grams of metallic sodium.*** Note: the metallic sodium should be added in small increments over a period of about 15 minutes, rather then all at once. After the addition of the metallic sodium, add in ***1.5 grams of dry oleic acid***, and then blend then entire mixture on moderate speed for about 30 minutes, under a nitrogen atmosphere. After 30 minutes, add in ***960 grams of finely divided calcium carbide***, and then continue to blend the mixture for about 15 minutes under a nitrogen atmosphere. Note: all solid compounds can be added using the powder addition funnel (commercially available). After 15 minutes stirring, the dispersion should be carefully filtered to recover the granulated material. Thereafter, the granulated material should be vacuum dried until dry. Thereafter, the mixture can be safely stored in a desiccator over anhydrous sodium sulfate under a nitrogen atmosphere until use. To use the mixture, it simply needs to be packed into any desirable air-tight, moisture free containers, bulbs, vials, tubes, or anything that you may have in mind, and then primed using any desirable materials, either a fuse, or exploding priming charge. Depending on the type of operation, packing the material in a suitable grenade made of cardboard or mild plastic, and then using a standard bursting charge to disseminate the mixture over a designated area upon ignition, can be used to properly disseminate the mixture on a target area with maximum results. On another note, the mixture can be used as an awkward incendiary agent by packing it into any desirable breakable container, or the like, which can be used to start fires in wet areas by simply throwing the device and allowing it to rupture upon impact with the target, or equivalent. **Note: ignites spontaneously when exposed to water producing a high temperature burning flame.**



Possible setup for the preparation of the pyrophoric dispersion.

Burn rate: Violent.
Flame temperature: 1900 to 2400 Celsius.
Water resistance: Poor.
Stability: Can be stored for many years.
Flammability (1 to 10): 9 (based on reactivity).
Ease of ignition (1 to 10): 9 (based on reactivity).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***92.1% calcium carbide, 7.6% metallic sodium, 0.16% residue, 0.14% oleic acid***
Classification: Classified as pyrophoric mixture.
Use: Can be used in grenades, capsules, flares, rockets, missile warheads, and incendiary bombs for use against flammable targets in wet areas, or equivalent.

06-05-006A: Reactive non-pyrophoric "jelly" composition that may ignite in contact with water:
Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***325 grams of a 50/50 mixture of "petrol", and standard heating oil***, followed by ***25 grams of finely divided silicon dioxide***, followed by ***25 grams of finely divided polystyrene***, and then blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***100 grams of finely divided calcium carbide***, followed by ***25 grams of finely divided metallic sodium***, and then continue to blend the mixture on moderate speed for about 15 to 30 minutes at room temperature. Thereafter the jelly-like material is ready for use. To use, it can be poured, pressed, and vibrated into any suitable grenade body, container, tube, warhead casing, bomb casing, ect., and then a standard bursting charge inserted to properly disseminate the mixture over a designated area upon ignition. The jelly can also be used directly as in "napalm" type devices, whereby the bomb casing is fragmented over the target to disseminate the jelly over the target area. The jelly can also be sprayed directly from flame throwing devices or the like, or sprayed from air delivered vehicles and the like. **Note: this substance is not regarded as pyrophoric, but may ignite spontaneously when exposed to water.**
Burn rate: Similar to Napalm.
Flame temperature: 2000 to 2800 Celsius.
Water resistance: Poor.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ½ (based on reactivity).
Ease of ignition (1 to 10): 9 (based on reactivity).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***32.5% standard heating oil, 32.5% petrol, 20% calcium carbide, 5% metallic sodium, 5% silicon dioxide, 5% polystyrene***

Classification: Classified as incendiary agent mixture with possible pyrophoric properties.
Use: Can be used in grenades, rockets, missile warheads, "napalm" like bombs, and flamethrowers for use against flammable targets.

06-05-007A: Reactive non-pyrophoric "jelly" composition capable of igniting in contact with water (modified):

Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***325 grams of a 50/50 mixture of "petrol", and standard heating oil***, followed by ***25 grams of finely divided silicon dioxide***, followed by ***25 grams of finely divided polystyrene***, and then blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***100 grams of finely divided calcium carbide***, followed by ***25 grams of finely divided metallic sodium***, and then continue to blend the mixture on moderate speed for about 15 to 30 minutes at room temperature. Thereafter, add in ***250 grams of sodium nitrate***, followed by ***250 grams of potassium nitrate***, followed by ***250 grams of dark pyrogenic aluminum*** (commercially available), and then continue to blend the viscous jelly material for about 15 to 30 minutes at high speed at room temperature. After 15 to 30 minutes, the semi-jelly like material is ready for use. To use, it can be poured, pressed, and vibrated into any suitable grenade body, container, tube, warhead casing, bomb casing, ect., and then a standard bursting charge inserted to properly disseminate the mixture over a designated area upon ignition. The jelly can also be used directly as in "napalm" type devices, whereby the bomb casing is fragmented over the target to disseminate the jelly over the target area. The jelly may also be sprayed directly from flame throwing devices or the like, or sprayed from air delivered vehicles and the like, but higher viscosity then 06-05-006A may decrease flowabilty. **Note: this substance is not regarded as pyrophoric, but can ignite spontaneously when exposed to water.**
Burn rate: Similar to Napalm.
Flame temperature: 2200+ Celsius.
Water resistance: Poor.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾ (based on reactivity).
Ease of ignition (1 to 10): 8 to 9 (based on reactivity).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***20% potassium nitrate, 20% dark pyrogenic aluminum, 20% sodium nitrate, 13% petrol, 13% standard heating oil, 8% calcium carbide, 2% silicon dioxide, 2% polystyrene, 2% metallic sodium***
Classification: Classified as incendiary agent mixture with possible pyrophoric properties.
Use: Can be used in grenades, rockets, missile warheads, "napalm" like bombs, and flamethrowers for use against flammable targets.

06-05-008A: Reactive non-pyrophoric dry composition capable of igniting in contact with water:

Into a special ball mill equipped with air-tight lid and nitrogen atmosphere, and filled with 50 grams of Teflon coated steel shot of 5 millimeters in diameter, place 50 grams of steel shot of 8 millimeters in diameter, and 50 grams of steel shot of 10 millimeters in diameter, and then add in ***400 grams of finely divided calcium carbide***, followed by ***85 grams of metallic sodium***, and then followed by ***15 grams of any standard lubricating oil***, and then tumble the mixture for about 1 hour at 50 RPM under nitrogen atmosphere. After 1 hour, the uniform powder is ready for use. To use, it should be pressed into any desirable grenade body, shell casing, container, bomb casing, ect, under a pressure of about 1500 psi, and then a bursting charge, or standard ignition charge placed there into in the usual manner. For best results, a bursting charge should be used, but ignition using a standard igniter composition will produce a good burn.
Note: this substance is not regarded as pyrophoric, but can ignite spontaneously when exposed to water.
Burn rate: Similar to Napalm.
Flame temperature: 2200+ Celsius.
Water resistance: Poor.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 (based on straight burn), 7 ¾ (based on water reactivity).
Ease of ignition (1 to 10): 8 (using ignition composition), 9 (based on water reactivity).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% calcium carbide, 17% metallic sodium, 3% lubricating oil***
Classification: Classified as incendiary agent mixture with possible pyrophoric properties.
Use: Can be used in grenades, rockets, missile warheads, and general-purpose incendiary munitions for use against flammable targets.

06-05-009A: Re-ignitable match composition:

Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of any desired diameter, place ***12.5 grams of manganese dioxide***, followed by ***12.5 grams of polyoxymethylene***, followed by ***112.5 grams of polymethyl methacrylate***, followed by ***10 grams of finely powdered silica***, followed by ***10 grams of corn starch***, followed by ***10 grams of ammonium dichromate***, and then tumble the mixture at 50 to 80 RPM for about 1 hour to form a uniform powder. Thereafter, add in ***115 grams of potassium chlorate***, and then continue to tumble the mixture at 50 to 80 RPM for about 30 minutes. After 30 minutes, place the dry mixture into a suitable beaker, mixing bowl, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, and then add in 50 milliliters of methyl ethyl ketone, and then blend the mixture on moderate speed for about 10 to 15 minutes to form a homogenous mixture.

Immediately thereafter, the mixture should be cast into bars, rods, sheets, or any other desirable length and diameter, and then allowed to cure for a day or so. The wet mixture can also be coated onto the surface of an iron rod of 2 to 5 millimeters in diameter to form a "sparkler" type device that can be ignited, extinguished, and ignited over and over again until the fuel is consumed. In all cases, the composition can be ignited by "striking" it in a conventional way as a match is, but the mixture is much easier to extinguish then a conventional match composition.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.7% potassium chlorate, 39.8% polymethyl methacrylate binder, 4.4% manganese dioxide catalyst, 4.4% polyoxymethylene burn modifier, 3.5% silica burn modifier, 3.5% corn starch filler, 3.5% ammonium dichromate quenching agent, 0.20% residue***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make re-ignitable match devices such as rods or sticks for repeated use.

06-05-010A: "Flash light" pyrotechnic composition producing high intensity actinic light:

Into a suitable heated ball mill, filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***300 grams of cerium oxide***, followed by ***16 grams of vanadic acid***, followed by ***500 grams of finely powdered magnesium***, followed by 100 milliliters of hexane, and then tumble the mixture at 100 RPM at about 60 Celsius until the bulk of the hexane evaporates. Thereafter, place the mixture into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer, and then add in ***31 grams of Epon 815 epoxy resin or equivalent***, and then blend the mixture on moderate speed for about 10 to 15 minutes. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into any desirable flare body, container, fish-paper tube, ect, under the usual manner, and then first cure it in an oven at 78 Celsius for about 30 minutes, and then cure at room temperature for several days. Can be ignited using any suitable means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***59% magnesium, 35.4% cerium oxide, 3.6% epoxy resin, 1.8% vanadic acid 0.20% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in flares and illumination devices for ground or aerial use. May also be used as a tracer composition.

06-05-010B: "Flash light" pyrotechnic composition producing high intensity actinic light (modified):

Into a suitable heated ball mill, filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***100 grams of cerium oxide***, followed by ***100 grams of calcium hydroxide***, followed by ***500 grams of finely powdered magnesium***, followed by 100 milliliters of hexane, and then tumble the mixture at 100 RPM at about 60 Celsius until the bulk of the hexane evaporates. Thereafter, place the mixture into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer, and then add in ***31 grams of Epon 815 epoxy resin or equivalent***, and then blend the mixture on moderate speed for about 10 to 15 minutes. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into any desirable flare body, container, fish-paper tube, ect, under the usual manner, and then first cure it in an oven at 78 Celsius for about 30 minutes, and then cure at room temperature for several days. Can be ignited using any suitable means.
Burn rate: Average.
Water resistance: Moderate.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***68.3% magnesium, 13.6% cerium oxide, 13.6% calcium hydroxide, 4.2% epoxy resin, 0.3% mixed impurities***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used in flares and illumination devices for ground or aerial use. May also be used as a tracer composition.

06-05-011A: Flash powder for photography (early 20th century):

Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***200 grams of finely powdered magnesium***, followed by ***200 grams of sodium tungstate***, and then tumble the mixture for 75 RPM for about 1 hour. After 1 hour, the mixture is ready to be used, and can be used directly. Note: for producing colored effects, barium nitrate can be added to produce a green color, copper salts for blue, and strontium for red. The ration of these salts should be 1 part per 5 parts of flash powder.
Burn rate: Rapid. Burns in less then ¼ of a second.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% sodium tungstate, 50% magnesium***
Classification: Deflagrating explosive (classified as explosive pyrotechnic mixture).
Use: Formerly used in photography, but may be used in fireworks for making flash light devices that emit intermittent bursts of magnesium light.

06-05-012A: Flash powder for photography and illuminating purposes (mid 20th century):
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***300 grams of sodium nitrate***, followed by ***900 grams of powdered magnesium*** of about 100 mesh, and then tumble the mixture at 200 to 300 RPM for about 1 hour to form a uniform mixture. After 1 hour, the mixture is ready to be used, and can be used directly as a loose powder, which is preferred.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% magnesium, 25% sodium nitrate***
Classification: Deflagrating explosive (classified as explosive pyrotechnic mixture).
Use: Formerly used in photography, but may be used in fireworks for making flash light devices that emit intermittent bursts of magnesium light.

06-05-013A: Water reactive pyrotechnic composition for generating heat, gas, and flame upon contact with water:
Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***150 grams of finely divided zinc of 40 to 80 mesh***, followed by ***150 grams of finely powdered ammonium chloride***, and then followed by ***150 grams of finely powdered ammonium nitrate***. Thereafter, add in 150 milliliters of acetone, and then blend the mixture on moderate speed until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass into a desiccator filled with anhydrous sodium sulfate, or metallic sodium, and then apply a vacuum to the desiccator to remove the last remaining solvent. Once the mixture is thoroughly dry, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 30 to 40 minutes to form a uniform powder. Note: keep the ball mill sealed to keep out moisture. Thereafter, the mixture is ready for use. To use, the mixture can be used directly as a loose powder, or it can be pressed under high pressure into any desirable container. Requires no ignition composition, as it is water reactive. The mixture will begin to smoke, and then catch fire when exposed to water. If the mixture is submerged in water, large amounts of gas will be evolved, so this mixture can be used for opening clogged drains and the like.
Burn rate: Slow.
Water resistance: Poor.
Stability: Can be stored for many years.
Flammability (1 to 10): 3 at first, increases to 5 to 6
Ease of ignition (1 to 10): 10 (based on water reactivity).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.33% zinc, 33.33% ammonium chloride, 33.33% ammonium nitrate, 0.01% balance***
Classification: Deflagrating explosive (classified as water reactive pyrotechnic mixture).
Use: Can be used as a fire starter, and for use in un-clogging toilets, drains, and pipes.

06-05-013B: Water reactive pyrotechnic composition for generating heat, gas, and flame upon contact with water (with increased stability):

Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***90 grams of finely divided zinc of 40 to 80 mesh***, followed by ***60 grams of finely powdered ammonium chloride***, followed by ***141 grams of finely powdered ammonium nitrate***, and then followed by ***9 grams of PVC molding powder***. Thereafter, add in 150 milliliters of acetone, and then blend the mixture on moderate speed until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass into a desiccator filled with anhydrous sodium sulfate, or metallic sodium, and then apply a vacuum to the desiccator to remove the last remaining solvent. Once the mixture is thoroughly dry, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 30 to 40 minutes to form a uniform powder. Note: keep the ball mill sealed to exclude moisture. Thereafter, the mixture is ready for use. To use, the mixture should be placed into a suitable beaker, and then gently heated until the PVC molding compound softens. Thereafter, the softened mixture should be pressed into pellets, tablets, or blocks of any desirable size. The mixture can also be used directly as a loose powder, or it can be pressed under high pressure into any desirable container. Requires no ignition composition, as it is water reactive. The mixture will begin to smoke, and then catch fire when exposed to water. If the mixture is submerged in water, large amounts of gas will be evolved, so this mixture can be used for opening clogged drains and the like.
Burn rate: Slow.
Water resistance: Poor.
Stability: Can be stored for many years.
Flammability (1 to 10): 2 at first, increases to 5
Ease of ignition (1 to 10): 9+ (based on water reactivity).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47% ammonium nitrate, 30% zinc, 20% ammonium chloride, 3% PVC molding powder***
Classification: Deflagrating explosive (classified as water reactive pyrotechnic mixture).
Use: Can be used as a fire starter, and for use in un-clogging toilets, drains, and pipes.

06-05-014A: Magnesium fuel for ramjet projectiles:
Into a suitable beaker or similar container, equipped with a motorized stirrer in the usual manner, place ***249 grams of magnesium of 325 mesh***, followed by ***27 grams of sodium nitrate,*** followed by ***24 grams of rubber cement***, and the mixture on high for about 10 to 15 minutes to form a uniform mixture. Thereafter, cast the mixture into any desirable projectile, container, ect., under moderate pressure, and then allow the mixture to cure for 24 hours or more. The mixture should be ignited using any suitable means.
Burn rate: 5 inches per minute.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***83% magnesium, 9% sodium nitrate, 8% rubber cement***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in ramjet projectiles as a fuel.

06-05-014B: Magnesium fuel for ramjet projectiles (with burn modifier):
Into a suitable beaker or similar container, equipped with a motorized stirrer in the usual manner, place ***267 grams of magnesium of 325 mesh***, followed by ***18 grams of sodium nitrate,*** followed by ***9 grams of stearic acid,*** and then followed by ***6 grams of rubber cement***, and the mixture on high for about 10 to 15 minutes to form a uniform mixture. Thereafter, cast the mixture into any desirable projectile, container, ect., under moderate pressure, and then allow the mixture to cure for 24 hours or more. The mixture should be ignited using any suitable means.
Burn rate: 3 inches per minute.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***89% magnesium, 6% sodium nitrate, 3% stearic acid, 2% rubber cement***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in ramjet projectiles as a fuel.

06-05-015A: Specialty incendiary composition that ignites violently upon contact with water:
Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***283 grams of finely powdered magnesium of 200 mesh***, followed by ***17.7 grams of calcium phosphide of 200 mesh***, and then followed by ***8.85***

grams of potassium perchlorate. Thereafter, add in 150 milliliters of hexane, and then blend the mixture on moderate speed until the bulk of the hexane evaporates. Note: use great caution as to keep the mixture absolutely dry during the mixing process. Thereafter, place the semi-pasty mass into a desiccator filled with anhydrous sodium sulfate, or metallic sodium, and then apply a vacuum to the desiccator to remove the last remaining solvent. Once the mixture is thoroughly dry, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot, and then tumble the mixture at 100 RPM for about 30 to 40 minutes to form a uniform powder. Note: keep the ball mill sealed to keep out moisture. Thereafter, the mixture is ready for use. To use, the mixture can be used directly as a loose powder, or it can be pressed under high pressure into any desirable container, or bomb casing. The mixture is best used by using a small black powder bursting charge to scatter the mixture. The mixture will ignite violently and burn at high temperature upon contact with water.
Burn rate: Explosive.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 10
Ease of ignition (1 to 10): 10 (based on water reactivity).
Tendency to cake: None.
Explosive ability: Explodes upon contact with water.
Percentage: ***91.4% magnesium, 5.7% calcium phosphide, 2.85% potassium perchlorate, 0.05% balance***
Classification: Deflagrating explosive (classified as explosive water reactive mixture).
Use: Used in incendiary projectiles, and grenades for starting fires in wet environments.

06-05-016A: Reduced wake propellant composition for propelling torpedoes:

Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***102.3 grams of finely powdered aluminum***, followed by ***197.7 grams of potassium perchlorate***, and then followed by ***123 grams of finely divided cobalt metal.*** Thereafter, add in 150 milliliters of ether, and then blend the mixture on moderate speed until the bulk of the ether evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and then allow it to thoroughly air-dry. Once the mixture is thoroughly dry, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot, and then tumble the mixture at 100 to 150 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture should be wetted with a small amount of ether or hexane to form a paste, and the resulting paste should be pressed into any desirable container, tube, torpedo, projectile, mold, ect., and then allowed to thoroughly dry. The mixture is readily ignited by the usual means.
Burn rate: 0.75 to 0.85 inches per second (based on dry land firing) at 100 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on dry land firing).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: May explode under severe conditions
Percentage: ***46.7% potassium perchlorate, 29% cobalt, 24.1% aluminum, 0.2% balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to propel torpedoes and other under water projectiles.

06-05-016B: Reduced wake propellant composition for propelling torpedoes (modified):

Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***61.8 grams of finely divided beryllium metal,*** followed by ***238.2 grams of potassium perchlorate***, and then followed by ***123 grams of finely divided copper metal.*** Thereafter, add in 150 milliliters of ether, and then blend the mixture on moderate speed until the bulk of the ether evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and then allow it to thoroughly air-dry. Once the mixture is thoroughly dry, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot, and then tumble the mixture at 100 to 150 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture should be wetted with a small amount of ether or hexane to form a paste, and the resulting paste should be pressed into any desirable container, tube, torpedo, projectile, mold, ect., and then allowed to thoroughly dry. The mixture is readily ignited by the usual means.
Burn rate: 0.80 to 0.85 inches per second (based on dry land firing) at 100 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on dry land firing).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: May explode under severe conditions.
Percentage: ***56.3% potassium perchlorate, 29% copper, 14.6% beryllium metal, 0.1% balance***
Classification: Deflagrating explosive (classified as explosive mixture).

Use: Used to propel torpedoes and other under water projectiles.

06-05-016C: Reduced wake propellant composition for propelling torpedoes (modified 2):

Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***132.6 grams of finely divided magnesium metal***, followed by ***156.9 grams of lithium perchlorate***, and then followed by ***123 grams of finely divided tin metal.*** Thereafter, add in 150 milliliters of ether, and then blend the mixture on moderate speed until the bulk of the ether evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and then allow it to thoroughly air-dry. Once the mixture is thoroughly dry, place the dried mass into a clean ball mill, filled with 150 grams of Teflon coated steel shot, and then tumble the mixture at 100 to 150 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture should be wetted with a small amount of ether or hexane to form a paste, and the resulting paste should be pressed into any desirable container, tube, torpedo, projectile, mold, ect., and then allowed to thoroughly dry. The mixture is readily ignited by the usual means.
Burn rate: 0.80 to 0.85 inches per second (based on dry land firing) at 100 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on dry land firing).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: May explode under severe conditions.
Percentage: ***38.4% lithium perchlorate, 31.9% magnesium, 29.6% tin metal, 0.10% balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used to propel torpedoes and other under water projectiles.

06-05-017A: Pyrophoric water reactive incendiary composition for starting oil slick fires and catching flammable liquids with water on fire:

Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place ***50 grams of standard asphalt***, followed by 450 grams of hexane, followed by ***1200 grams of finely powdered magnesium***, and then blend the mixture for about 10 minutes. Thereafter, heat the mixture to 69 Celsius and evaporate-off about 25% of the solvent to form a uniform paste. Thereafter, remove the heat source, and then allow the mixture to cool to room temperature. Thereafter, place this paste into a clean ball mill, filled 200 grams of Teflon coated steel shot, of 5 millimeters in diameter, and then add in ***258 grams of pulverized calcium carbide,*** followed by ***258 grams of finely divided red iron-III-oxide***. Then tumble the mixture at 150 to 200 RPM for about 45 to 90 minutes, and then during the last few minutes, apply a mild vacuum to remove the last amounts of solvent. Note: keep the ball mill sealed during the tumbling operation, and equipped with drying tube or similar means to exclude moisture. Thereafter, once the remaining solvent has been removed, continue to tumble the mixture at 150 RPM for about 30 minutes. After about 30 additional minutes of tumbling, the mixture is ready for use. To use, it needs to be pressed into plastic tubes, or paper tubes under high pressure. Note: the tubes should remain sealed airtight during storage to prevent ignition. The composition is used by removing one of the airtight end caps, or removing a small stopper in the end cap, and then throwing the device into water, and/or water containing oil. The water reactive mixture usually takes anywhere from 3 to 6 minutes before it catches fire.
Burn rate: Uncalculated.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on burning rate under water).
Ease of ignition (1 to 10): 5+ based on initial contact with water, 8+ after 3 minutes or more.
Tendency to cake: None.
Explosive ability: Very little.
Percentage: ***67.95% magnesium, 14.6% calcium carbide, 14.6% iron-III-oxide, 2.83% asphalt, 0.05% balance***
Classification: Deflagrating explosive (classified as water reactive/pyrotechnic mixture).
Use: Used to ignite oil slicks, or other flammable liquid/water immersions especially during spills.

06-05-018A: Friction sensitive pyrophoric composition for self-lighting cigars:

Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer utilizing a plastic stir blade, place 100 milliliters of warm water, immediately followed by ***20 grams of gum acacia,*** followed by ***20 grams of starch.*** Thereafter, blend the mixture on moderate speed for about 10 minutes. After 10 minutes, add in ***15 grams of finely ground silica***, followed by ***70 grams of carbon black,*** and then continue to blend the mixture for about 10 minutes at room temperature. Thereafter, add in ***15 grams of manganese dioxide,*** and then followed by ***115 potassium chlorate,*** and then continue to blend the mixture for about 15 to 30 minutes to form a uniform paste. Thereafter, the paste is ready for use. To use, the paste simply needs to be placed onto the tip of any desired cigar, and then allowed to cure. The paste if desired, can be dried and then pressed into pellets or tablets in the usual manner for use in other devices.
Burn rate: Moderate.
Water resistance: Good.

Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on burning rate under water).
Ease of ignition (1 to 10): 8 (based on friction sensitivity).
Tendency to cake: None.
Explosive ability: Very little.
Percentage: ***45% potassium chlorate, 27% carbon black, 8% gum acacia, 8% starch, 6% ground silica, 6% manganese dioxide***
Classification: Deflagrating explosive (classified as pyrophoric mixture).
Use: Used to ignite cigars in the same manner as striking a match.

06-05-019A: Flashlight composition for various uses:
Into a suitable mixing bowl, container, or equivalent, equipped with motorized stirrer in the usual manner, place 750 milliliters of 95% alcohol, and thereafter, add and dissolve 75 grams of pyroxylin compound. Thereafter, add in ***900 grams of potassium chlorate,*** and then followed by ***750 grams of magnesium powder.*** Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, filter-off the insoluble mass, but don't dry it. Thereafter, the mixture is ready for use. To use, coat the mixture, as a thin layer, onto a sheet of aluminum foil, and then allow the mixture to dry thoroughly. To use the coated foil, it simply needs to be wired with a bridge, or ignited using a typical black powder fuse. When ignited the composition produces a brilliant flash of light.
Burn rate: Fast.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Very little.
Percentage: ***54.54% potassium chlorate, 45.45% magnesium powder, 0.01% pyroxylin***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Used for singling, spotting, and similar purposes.

06-05-020A: High temperature resistant ignition composition activated by laser:
Into a suitable ball mill, or rotating device, filled with 250 grams of Teflon coated steel shot, place ***442 grams of tellurium dioxide,*** followed by ***33 grams of born powder.*** Thereafter, spray in about 15 milliliters of acetone, and then tumble the mixture at 500 RPM for about 2 hours. Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***25 grams of Viton B*** (fluoroelastomeric binder copolymer of vinylidene fluoride and hexaflroropropylene). Thereafter, heat the mixture to about 60 Celsius, and then blend it for about 15 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, pellets, ect., under high pressure in the usual manner.
Burn rate: Fast.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Very little.
Percentage: ***88.4% tellurium dioxide, 6.6% boron powder, 5% Viton B binder***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in experimental devices where a laser is used to activate the composition.

06-05-021A: Red flash powder for various uses:
Into a suitable ball mill, or rotating device, filled with 250 grams of Teflon coated steel shot, place ***100 grams of aluminum powder,*** followed by ***35 grams of red phosphorus,*** followed by ***50 grams of magnesium powder,*** followed by ***40 grams of sodium oxalate,*** and then followed by ***400 grams of strontium nitrate.*** Thereafter, tumble the mixture at 500 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be placed loosely into flash bags, or pressed into tablets, pellets, ect, under high pressure, depending on the desired purposes of use.
Burn rate: Very fast when in loose form.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (based on ignition of loose powder).
Tendency to cake: None.
Explosive ability: Very little.
Percentage: ***64% strontium nitrate, 16% aluminum powder, 8% magnesium powder, 6.4% sodium oxalate, 5.6% red phosphorus***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).

Use: Can be used for photography, fireworks, and any other desired purposes.

06-05-022A: Flash light powder for various uses:
Into a suitable ball mill, or rotating device, filled with 250 grams of Teflon coated steel shot, place ***450 grams of magnesium powder,*** followed by ***9 grams of flours of sulfur,*** followed by ***70 grams of potassium permanganate,*** followed by ***42.5 grams of potassium nitrate,*** followed by ***80 grams of magnesia,*** and then followed by ***15 grams of soft wood charcoal.*** Thereafter, tumble the mixture at 175 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be placed loosely into flash bags, or pressed into tablets, pellets, ect, under high pressure, depending on the desired purposes of use.
Burn rate: Very fast when in loose form.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (based on ignition of loose powder).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***67.51% magnesium powder, 12% magnesia, 10.5% potassium permanganate, 6.37% potassium nitrate, 2.25% soft wood charcoal, 1.35% sulfur, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as explosive mixture).
Use: Can be used for photography, fireworks, and any other desired purposes.

06-05-022B: Flash light powder for various uses:
Into a suitable ball mill, or rotating device, filled with 250 grams of Teflon coated steel shot, place ***420 grams of magnesium powder,*** followed by ***96 grams of aluminum powder,*** followed by ***168 grams of calcium carbonate,*** followed by ***72 grams of powdered silicon dioxide,*** and then followed by ***36 grams of magnesia.*** Thereafter, tumble the mixture at 175 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be placed loosely into flash bags, or pressed into tablets, pellets, ect, under high pressure, depending on the desired purposes of use.
Burn rate: Very fast when in loose form.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (based on ignition of loose powder).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***53.03% magnesium powder, 21.21% calcium carbonate, 12.12% aluminum powder, 9.09% silicon dioxide, 4.54% magnesia, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for photography, fireworks, and any other desired purposes.

06-05-022C: Flash light powder for various uses:
Into a suitable ball mill, or rotating device, filled with 250 grams of Teflon coated steel shot, place ***390 grams of magnesium powder,*** followed by ***90 grams of aluminum powder,*** followed by ***150 grams of finely ground alabaster,*** followed by ***72 grams of powdered silicon dioxide,*** and then followed by ***36 grams of magnesia.*** Thereafter, tumble the mixture at 275 RPM for about 2 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be placed loosely into flash bags, or pressed into tablets, pellets, ect, under high pressure, depending on the desired purposes of use.
Burn rate: Very fast when in loose form.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (based on ignition of loose powder).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.84% magnesium powder, 20.32% ground alabaster, 12.19% aluminum powder, 9.75% silicon dioxide, 4.87% magnesia, 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used for photography, fireworks, and any other desired purposes.

06-05-023A: Heat producing pyrotechnic composition for starting campfires:
Into a suitable mixing bowl, equipped with motorized stirrer, place 250 milliliters of ether, and then add in ***75 grams of potassium chlorate,*** followed by ***300 grams of ground pumice.*** Thereafter, blend the mixture for about 15 minutes at moderate speed. Thereafter, add in ***200 grams of Kaolin,*** followed by ***150 grams of aluminum powder,*** followed by ***100 grams of finely ground brass shavings,***

followed by ***50 grams of copper-II-oxide***, followed by ***5 grams of linseed oil***, and then followed by ***30 grams of para-toluene sulfonic acid***. Thereafter, blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, or pellets of any desirable diameter under high pressure, and then cured at room temperature until dry and hard. Note: keep the mixture away from water and moisture.
Burn rate: Very slow.
Water resistance: Poor.
Stability: Can be stored for several years if kept away from water and moisture.
Flammability (1 to 10): 3
Ease of ignition (1 to 10): 3
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***32.96% ground pumice, 21.97% Kaolin, 16.48% aluminum powder, 10.98% ground brass, 8.24% potassium chlorate, 5.49% copper-II-oxide, 3.29% para-toluene sulfonic acid, 0.54% linseed oil, 0.05% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to start campfires for survival purposes. The mixture tends to generate heat due to chemical reactions when exposed to water.

06-05-023B: Heat producing pyrotechnic composition for starting campfires:

Into a suitable ball mill, or vertical mixer, place ***5 grams of mineral oil***, and then followed by ***200 grams of powdered aluminum***. Thereafter, tumble the mixture at 75 RPM for about 10 minutes. Thereafter, add in ***50 grams of copper-I-oxide***, and then followed by ***30 grams of benzene sulfonic acid.*** Thereafter, continue to tumble the mixture at 75 RPM for about 20 minutes. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 250 milliliters of ether. Thereafter, add in ***300 grams of pumice***, followed by ***200 grams of Kaolin***, and then followed by ***75 grams of potassium chlorate***. Thereafter, blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tablets, or pellets of any desirable diameter under high pressure, and then cured at room temperature until dry and hard. Note: keep the mixture away from water and moisture.
Burn rate: Very slow.
Water resistance: Poor.
Stability: Can be stored for several years if kept away from water and moisture.
Flammability (1 to 10): 3
Ease of ignition (1 to 10): 3
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***34.88% pumice, 23.25% Kaolin, 23.25% powdered aluminum, 8.72% potassium chlorate, 5.81% copper-I-oxide, 3.48% benzene sulfonic acid, 0.58% mineral oil, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to start campfires for survival purposes. The mixture tends to generate heat due to chemical reactions when exposed to water.

06-05-024A: Reduced wake propellant composition for underwater torpedoes:

Into a suitable ball mill, or vertical mixer, equipped with inert atmosphere, place ***261.5 grams of metallic sodium***, and then followed by ***238.5 grams of barium perchlorate***. Thereafter, tumble the mixture at 175 RPM for about 45 minutes in an inert atmosphere. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and inert atmosphere, and then add in ***50 grams of chromium dioxide***. Thereafter, blend the mixture on moderate speed for about 1 hour under an inert atmosphere. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed under high pressure into tablets, or pellets of any desirable diameter, and then cure at room temperature under an inert atmosphere until dry and hard. Note: keep the mixture away from water and moisture.
Burn rate: Moderate.
Water resistance: Poor.
Stability: Can be stored for several years if kept away from water and moisture.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47.54% metallic sodium, 43.36% barium perchlorate, 9.09% chromium dioxide burn catalyst, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in torpedoes for propulsion.

06-05-024B: Reduced wake propellant composition for underwater torpedoes:

Into a suitable ball mill, or vertical mixer, place ***191.5 grams of finely ground zinc powder***, and then followed by ***308.5 grams of potassium permanganate***. Thereafter, tumble the mixture at 175 RPM for about 45 minutes. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***50 grams of nickel oxide***. Thereafter, blend the mixture on moderate speed for about 1 hour under an inert atmosphere. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed under high pressure into tablets, or pellets of any desirable diameter, and then cure at room temperature until dry and hard.
Burn rate: Moderate.
Water resistance: Poor.
Stability: Can be stored for years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***56.09% potassium permanganate, 34.81% zinc powder, 9.09% nickel oxide, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Used in torpedoes for propulsion.

06-05-025A: Specialty friction sensitive composition for making re-ignitable matchsticks:

Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***325 grams of nitrocellulose***, followed by ***70 grams of camphor***, followed by ***100 grams of potassium chlorate***, followed by ***12.5 grams of potassium dichromate***, followed by ***12.5 grams of flours of sulfur***, followed by ***10 grams of ammonium oxalate***, followed by ***75 grams of powdered glass***, and then finally followed by ***50 grams of zinc dust***. Thereafter, add in 150 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 1 hour to form a uniform mass. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, sticks, or coated onto any desirable metal rod, or formed into match heads of any desired size, and then cured in an oven at ordinary temperatures.
Burn rate: Moderate.
Water resistance: Poor.
Stability: Can be stored for years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 (based on friction).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***49.61% nitrocellulose, 15.26% potassium chlorate, 11.45% powdered glass, 10.68% camphor, 7.63% zinc dust, 1.9% potassium dichromate, 1.9% sulfur, 1.52% ammonium oxalate, 0.05% balance***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make friction sensitive fire sticks, matches, or "punts", that can be ignited by friction, and readily extinguish, and then re-ignited again in the same manner.

06-05-025B: Specialty friction sensitive composition for making re-ignitable matchsticks:

Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***75 grams of nitrocellulose***, followed by ***165 grams of acetyl cellulose***, followed by ***15 grams of camphor***, followed by ***30 grams of sulfur***, followed by ***110 grams of potassium chlorate***, followed by ***35 grams of hexamine***, followed by ***20 grams of ammonium oxalate***, and then finally followed by ***50 grams of powdered glass***. Thereafter, add in 50 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 1 hour to form a uniform mass. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, sticks, or coated onto any desirable metal rod, or formed into match heads of any desired size, and then cured in an oven at ordinary temperatures.
Burn rate: Moderate.
Water resistance: Poor.
Stability: Can be stored for years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 (based on friction).
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***33% acetyl cellulose, 22% potassium chlorate, 15% nitrocellulose, 10% powdered glass, 7% hexamine, 6% sulfur, 4% ammonium oxalate, 3% camphor***
Classification: Deflagrating explosive (classified as pyrotechnic mixture).
Use: Can be used to make friction sensitive fire sticks, matches, or "punts", that can be ignited by friction, and readily extinguish, and then re-ignited again in the same manner.

Section 6: Experimental Pyrotechnic Compositions

This section is designed to explore the area of experimental compositions as it relates to exotic and other wise “strange” concoctions for various uses. However this area of pyrotechnics is still relatively un-investigated, but the following compositions do have a serious potential for use in modern warfare. To better understand experimental compositions, one should first understand the types of chemicals used to carryout various desires such as smoke, fog, bursting charges, confusion, anti-laser, and radio interference entities.

A) First of all, every experimental pyrotechnic composition that the user desires to create a smoke, burn, or other wise “non bursting” type effect contains an oxidizing agent.
B) Every pyrotechnic composition that the user desires to create a smoke, burn, or otherwise “non bursting” type composition needs a reducing agent.
C) Third, every experimental pyrotechnic composition the user desires to create a smoke, burn, or other wise “non bursting” type effect requires a filler, or “subject”. Subjects are a personnel term to describe a filler that either acts as a burn catalyst, or burn “modifier”, or performs some sort of action not related directly to the oxidizer. Subjects are often seen in high performance rocket propellants to reduce drag, smoke trails, and light signatures.
D) Fourth, every experimental pyrotechnic composition the user desires to create a smoke, burn, or other wise “non bursting” type effect, requires a tertiary agent. “Tertiary agents” are my personnel name for any chemical addictives that is required to induce a particular sub atomic effect such as a burst of white light, generation or interference with the electro magnetic spectrum, interference of laser beams and other sources of “condensed” light, and/or the generation and/or confusion of heat and heat recognition systems such as thermal imaging devices very commonly seen on tanks, helicopters, and aircraft.
E) Fifth, “addictives” are simple addition agents added to compromise the balance of the pyrotechnic compositions and provide a binder or otherwise binding agent to create a uniform mixture, and to maintain a uniform mixture despite long-term storage.

The following table reflects the various chemicals used in experimental compositions. The fifth element, being the “addictives”, is not included as it primarily deals with binding agents, such as epoxy resins, and similar agents.

Oxidizers	***Reducing agents***	***Subjects***	***Tertiary Agents***
Strontium nitrate	Magnesium powder	Calcium Carbide	Thorium oxide
Uranyl nitrate	Silicon	Bismuth trioxide	Thorium fluoride
Cesium nitrate	Cesium (powder, granules, flake)	Calcium sulfide	Uranium dioxide
Uranium dioxide	Aluminum nitride	Iron-II-oxide	Rubidium-I-chloride
Sodium nitrate	Tantalum sulfide	Beryllium metal	Rubidium sulfide
Plutonium-VI-oxide	Rubidium	Arsenic trioxide	Radium metal
Manganese dioxide	Titanium hydride	Teflon	Tantalum sulfide
Potassium permanganate	Calcium metal	Calcium phosphide	Radium-II-bromide
Potassium iodate	Lithium metal	Calcium silicide	Plutonium-IV-oxide
Lead dioxide	Sugar	Mercury-II-chloride	Magnesium flake
Potassium dichromate	Red phosphorus	Copper-II-oxide	Sodium hypophosphite
Potassium chlorate	Iron powder	Ammonium chloride	Ammonium chloride
Sodium chlorate	Aluminum (flake, powder)	PVC	Cesium fluoride
Sodium peroxide	Zinc (flake, powder)	Glucose	Arsenic trioxide
Silver nitrate	Sodium hypophosphite	Copper chromite	Magnesium phosphide
Magnesium peroxide	Carbon black	Chromium-III-chloride	Gallium arsenide
Magnesium perchlorate	Magnesium phosphide	White phosphorus	Osmium dioxide
Copper-II-nitrate trihydrate	White phosphorus	Boron metal	Cerium-III-nitrate
Aluminum nitrate anhydrous	Magnesium sulfide	Myristic acid	Cesium-I-iodide
Magnesium nitrate	Hexamine	Hexamine	Cesium137-iodide
Dimethylpyrone methyl perchlorate	Zirconium hydride	Ferric arsenite	Curium metal
	Aluminum citrate	Potassium picrate	Yttrium nitrate
	Antimony trisulfide	Silicon carbide	Rubidium-I-iodide
	Curium metal	Black phosphorus	Radium metal
	Beryllium hydride	Beryllium oxide	Rhenium metal
	Zinc dust	Sodium acetate	
	Bismuth powder	Hexachloroethane	
	Bituminous coal	Diethylamine hydrochloride	
	Calcium sulfide	Iron-III-bromide	
	Antimony pentasulfide	Copper-II-iodide	
	Rhenium metal	Starch	
	Charcoal	Mercury-II-thiosulfate	
		Barium oxide	
		Aluminum chloride anhydrous	
		Silver-I-iodide	
		Nitrocellulose	

If you desire, you can create and experiment with your own concoctions. To do so, use the following tables to choose from the various chemicals, by first selecting a group (oxidizer, reducing agent, ect., ect.,) from the master table. Second, for example, if we where to select oxidizer, 1 part, and we wanted to see what the reducing agent would be, in parts, we would look on “table 2: reducing agent”, by looking at the far right column containing A1, C1, D1, and E1 (for the oxidizer 1 part) and then going to B1 on the upper row (reducing agent table), this would give us 0.25 parts of reducing agent needed. Now, since we started with oxidizer, and we now have the parts of reducing agent, we now select a third group (subjects, tertiary agents, ect., ect.,), for example, we select subjects; therefore, we would look at “table 3: subjects”, and we look for B1 in table 3 at the far left column containing A1, B1, D1, and E1, and then row C1; Therefore, what we get is 0.03 parts. Next, we go either table 4, or table 5, but in this case, we go with table 4, and we look for C1 in the far left column, and then D1 in the upper row, what we get is 0.05 parts. Finally, we look at D1 on the far left column of table 5, and look at E1 on the upper row and we get 0.03 parts for this example. Note: not all percentages/parts/concoctions will work in real life.

TABLE 1: MASTER TABLE (starter table)

	1 part	**2 parts**	**3 parts**	**4 parts**	**5 parts**	**6 parts**	**7 parts**	**8 parts**	**9 parts**	**10 parts**
Oxidizer	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Reducing Agent	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Subjects	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Tertiary Agents	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Binder/ Filler	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10

TABLE 2: REDUCING AGENT

	B1	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**B10**
A1, C1, D1, E1	0.25 parts	0.50 parts	0.75 parts	1 part	1.25 parts	1.50 parts	1.75 parts	2 parts	2.25 parts	2.50 parts
A2, C2, D2, E2	0.50 parts	0.75 parts	1 part	1.25 parts	1.50 parts	1.75 parts	2 parts	2.25 parts	2.50 parts	2.75 parts
A3, C3, D3, E3	0.75 parts	1 part	1.25 parts	1.50 parts	1.75 parts	2 parts	2.25 parts	2.50 parts	2.75 parts	3 parts
A4, C4, D4, E4	1 part	1.25 parts	1.50 parts	1.75 parts	2 parts	2.25 parts	2.50 parts	2.75 parts	3 parts	3.25 parts
A5, C5, D5, E5	1.25 parts	1.50 parts	1.75 parts	2 parts	2.25 parts	2.50 parts	2.75 parts	3 parts	3.25 parts	3.5 parts
A6, C6, D6, E6	1.50 parts	1.75 parts	2 parts	2.25 parts	2.50 parts	2.75 parts	3 parts	3.25 parts	3.5 parts	3.75 parts
A7, C7, D7, E7	1.75 parts	2 parts	2.25 parts	2.50 parts	2.75 parts	3 parts	3.25 parts	3.5 parts	3.75 parts	4 parts
A8, C8, D8, E8	2 parts	2.25 parts	2.50 parts	2.75 parts	3 parts	3.25 parts	3.5 parts	3.75 parts	4 parts	4.25 parts
A9, C9, D9, E9	2.25 parts	2.50 parts	2.75 parts	3 parts	3.25 parts	3.5 parts	3.75 parts	4 parts	4.25 parts	4.5 parts
A10, C10, D10, E10	2.50 parts	2.75 parts	3 parts	3.25 parts	3.5 parts	3.75 parts	4 parts	4.25 parts	4.5 parts	4.75 parts

TABLE 3: SUBJECTS

	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**

A1, B1, D1, E1	0.03 parts	0.06 parts	0.09 parts	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts
A2, B2, D2, E2	0.06 parts	0.09 parts	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts
A3, B3, D3, E3	0.09 parts	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts
A4, B4, D4, E4	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts
A5, B5, D5, E5	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts
A5, B5, D5, E5	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts
A6, B6, D6, E6	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts
A7, B7, D7, E7	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts	0.51 parts
A8, B8, D8, E8	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts	0.51 parts	0.54 parts
A9, B9, D9, E9	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts	0.51 parts	0.54 parts	0.57 parts
A10, B10, D10, E10	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts	0.51 parts	0.54 parts	0.57 parts	0.60 parts

TABLE 4: TERTIARY AGENTS

	D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**
A1, B1, C1, E1	0.05 parts	0.10 parts	0.15 parts	0.20 parts	0.25 parts	0.30 parts	0.35 parts	0.40 parts	0.45 parts	0.50 parts
A2, B2, C2, E2	0.10 parts	0.15 parts	0.20 parts	0.25 parts	0.30 parts	0.35 parts	0.40 parts	0.45 parts	0.50 parts	0.55 parts
A3, B3, C3, E3	0.15 parts	0.20 parts	0.25 parts	0.30 parts	0.35 parts	0.40 parts	0.45 parts	0.50 parts	0.55 parts	0.60 parts
A4, B4, C4, E4	0.20 parts	0.25 parts	0.30 parts	0.35 parts	0.40 parts	0.45 parts	0.50 parts	0.55 parts	0.60 parts	0.65 parts
A5, B5, C5, E5	0.25 parts	0.30 parts	0.35 parts	0.40 parts	0.45 parts	0.50 parts	0.55 parts	0.60 parts	0.65 parts	0.70 parts
A6, B6, C6, E6	0.30 parts	0.35 parts	0.40 parts	0.45 parts	0.50 parts	0.55 parts	0.60 parts	0.65 parts	0.70 parts	0.75 parts
A7, B7, C7, E7	0.35 parts	0.40 parts	0.45 parts	0.50 parts	0.55 parts	0.60 parts	0.65 parts	0.70 parts	0.75 parts	0.80 parts
A8, B8, C8, E8	0.40 parts	0.45 parts	0.50 parts	0.55 parts	0.60 parts	0.65 parts	0.70 parts	0.75 parts	0.80 parts	0.85 parts
A9, B9, C9, E9	0.45 parts	0.50 parts	0.55 parts	0.60 parts	0.65 parts	0.70 parts	0.75 parts	0.80 parts	0.85 parts	0.90 parts
A10, B10, C10, E10	0.50 parts	0.55 parts	0.60 parts	0.65 parts	0.70 parts	0.75 parts	0.80 parts	0.85 parts	0.90 parts	0.95 parts

TABLE 5: BINDER/FILLER

	E1	**E2**	**E3**	**E4**	**E5**	**E6**	**E7**	**E8**	**E9**	**E10**
A1, B1, C1, D1	0.03 parts	0.06 parts	0.09 parts	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts
A2, B2, C2, D2	0.06 parts	0.09 parts	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts
A3, B3, C3, D3	0.09 parts	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts
A4, B4, C4, D4	0.12 parts	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts
A5, B5, C5, D5	0.16 parts	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts
A6, B6, C6, D6	0.18 parts	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts
A7, B7, C7, D7	0.21 parts	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts
A8, B8, C8, D8	0.24 parts	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts	0.51 parts
A9, B9, C9, D9	0.27 parts	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts	0.51 parts	0.54 parts
A10, B10, C10, D10	0.30 parts	0.33 parts	0.36 parts	0.39 parts	0.42 parts	0.45 parts	0.48 parts	0.51 parts	0.54 parts	0.57 parts

TABLE 6: OXIDIZER

	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**
B1, C1, D1, E1	4 parts	8 parts	12 parts	16 parts	20 parts	24 parts	28 parts	32 parts	36 parts	40 parts
B2, C2, D2, E2	8 parts	12 parts	16 parts	20 parts	24 parts	28 parts	32 parts	36 parts	40 parts	44 parts
B3, C3, D3, E3	12 parts	16 parts	20 parts	24 parts	28 parts	32 parts	36 parts	40 parts	44 parts	48 parts
B4, C4, D4, E4	16 parts	20 parts	24 parts	28 parts	32 parts	36 parts	40 parts	44 parts	48 parts	52 parts
B5, C5, D5, E5	20 parts	24 parts	28 parts	32 parts	36 parts	40 parts	44 parts	48 parts	52 parts	56 parts
B6, C6, D6, E6	24 parts	28 parts	32 parts	36 parts	40 parts	44 parts	48 parts	52 parts	56 parts	60 parts
B7, C7, D7, E7	28 parts	32 parts	36 parts	40 parts	44 parts	48 parts	52 parts	56 parts	60 parts	64 parts
B8, C8, D8, E8	32 parts	36 parts	40 parts	44 parts	48 parts	52 parts	56 parts	60 parts	64 parts	68 parts
B9, C9, D9, E9	36 parts	40 parts	44 parts	48 parts	52 parts	56 parts	60 parts	64 parts	68 parts	72 parts
B10, C10, D10, E10	40 parts	44 parts	48 parts	52 parts	56 parts	60 parts	64 parts	68 parts	72 parts	76 parts

- Experimental Pyrotechnic Compositions in this section -

1. 06-06-001A: "EMP" generating composition suitable for disabling electronic devices and communications: *31.3% strontium nitrate, 18.9% plutonium-VI-oxide, 18.9% cesium nitrate, 10.2% magnesium, 5.2% silicon, 4.8% thorium oxide, 4% thorium fluoride, 3.2% "Kraton" binder, 2.4% EPON 815 epoxy resin, 0.43% diatomaceous earth, 0.67% residue*	**2. 06-06-002A: Anti-radar pulsar used to confuse and scramble radar frequencies:** *31.46% uranyl nitrate, 27.97% sodium nitrate, 17.48% titanium hydride, 10.48% calcium carbide, 5.24% thorium fluoride, 3.84% uranium dioxide, 3.49% bismuth trioxide, 0.04% balance,*
3. 06-06-003A: Radar antagonist & anti-communication composition for confusing and disrupting radio frequencies of various intensity: *26.22% potassium permanganate, 18.73% rubidium oxide, 16.39% manganese dioxide, 11.70% aluminum nitride, 9.36% tantalum sulfide, 6% rubidium metal, 4.21% calcium metal, 3.74% lithium metal, 3.51% epoxy resin, 0.14% impurities*	**4. 06-06-004A: Anti-radar composition for generating a smoke screen for confusing and disrupting laser waves:** *35.39% sugar, 20.64% red phosphorus, 20.64% sodium nitrate, 8.84% rubidium metal, 7% iron, 4.42% rubidium-I-chloride, 2.94% rubidium sulfide, 0.13% mixed balance*
5. 06-06-005A: EMP/EMF composition for disrupting communications and electronic devices: *43.2% potassium permanganate, 20% radium metal, 9.6% calcium sulfide, 8% tantalum sulfide, 7.2% iron-II-oxide, 4.4% radium-II-bromide,*	**6. 06-06-006A: EMP/EMF composition for generating a fog for disrupting communications and electronic devices:** *42.45% potassium iodate, 17.92% sugar, 9.43% lead dioxide, 8.96% red phosphorus, 7% arsenic trioxide, 5.18% plutonium-*

4% plutonium-IV-oxide, 3.6% beryllium metal	*IV-oxide, 4.71% uranium dioxide, 4.24% beryllium metal, 0.11% impurities*
7. 06-06-007A: EMP/EMF composition for generating a cloud of particles to disrupt communications: *22.58% potassium iodate, 12.9% aluminum flake, 9.67% red phosphorus, 9.67% sodium nitrate, 9.67% rubidium metal, 9.67 thorium fluoride, 7.74% Teflon, 7.74% uranyl nitrate, 6.45% sugar, 3.87% potassium dichromate, 0.04% balance*	**8. 06-06-007B: EMP/EMF composition for generating a cloud of particles to disrupt communications:** *22% calcium phosphide, 16.52% potassium permanganate, 13.77% thorium fluoride, 12.67% uranyl nitrate, 11% zinc flake, 9.64% rubidium metal, 6.61% calcium silicide, 4.95% red phosphorus, 2.75% Teflon, 0.09% balance*
9. 06-06-008A: Laser antagonist compound containing dark green pulsar: *42.85% potassium chlorate, 23.8% sugar, 13.33% mercury-II-chloride, 11.42% red phosphorus, 5.23% tantalum sulfide, 3.33% copper-II-oxide, 0.04% impurities*	**10. 06-06-009A: Flash to bang pyrotechnic composition (with smoke) for spotting:** *30.61% ammonium chloride, 22.1% potassium permanganate, 20.4% sodium hypophosphite, 13.6% sodium chlorate, 8.16% magnesium flake, 5.1% sodium peroxide, 0.03% balance*
11. 06-06-009B: Flash to bang pyrotechnic composition (with increased smoke) for spotting: *31.71% ammonium chloride, 21.14% sodium chlorate, 13.38% red phosphorus, 13.31% potassium permanganate, 12.33% sodium peroxide, 6.34% magnesium flake, 1.76% carbon black, 0.03% balance*	**12. 06-06-010A: Pyrotechnic composition for producing radioactive smoke for disrupting communications:** *30.67% ammonium chloride, 18.4% sodium chlorate, 12.26% sugar, 10.73% uranium dioxide, 9.81% thorium fluoride, 7.66% red phosphorus, 6.13% potassium dichromate, 2.76% PVC, 1.53% carbon black, 0.05% residue*
13. 06-06-011A: Laser antagonist pyrotechnic composition for disrupting laser guided munitions (un-tested): *46.15% potassium nitrate, 12.3% cesium fluoride, 9.23% cadmium metal, 9.23% glucose, 7.38% red phosphorus, 4.61% arsenic trioxide, 4.3% ammonium chloride, 3.07% magnesium phosphide, 2.76% chromium-III-chloride, 0.92% copper chromite burn catalyst, 0.05% balance*	**14. 06-06-011B: Laser antagonist pyrotechnic composition for disrupting laser guided munitions (un-tested):** *46.51% uranyl nitrate, 23.25% white phosphorus, 11.16% magnesium sulfide, 6.97% boron metal, 6.04% myristic acid, 4.65% hexamine, 1.39% ferric arsenite burn catalyst, 0.03% impurities*
15. 06-06-012A: Anti-thermal imaging composition for confusing and disrupting thermal imaging systems: *28.8% silver nitrate, 14.4% zirconium hydride, 12.34% magnesium peroxide, 9.87% potassium picrate, 8.23% gallium arsenide, 7.4% osmium dioxide, 7.4% silicon carbide, 6.99% bismuth trioxide, 4.52% black phosphorus, 0.05% mixed residual balance*	**16. 06-06-013A: Anti-thermal imaging composition for confusing and disrupting thermal imaging systems:** *42.55% magnesium perchlorate, 12.76% cerium-III-nitrate, 12.76% cesium flake, 8.51% cesium-I-iodide, 8.51% beryllium oxide, 6.38% aluminum citrate, 6.38% copper-II-nitrate trihydrate, 2.12% potassium dichromate, 0.03% impurities*
17. 06-06-014A: Pyrotechnic composition for generating a radioactive smoke for disrupting communications: *42.45% cesium137-iodide, 18.86% potassium dichromate, 16.03% potassium chlorate, 11.79% antimony trisulfide, 9.43% red phosphorus, 1.41% sodium acetate, 0.03% mixed balance*	**18. 06-06-015A: Radioactive pyrotechnic compositions for flares to produce a smoke for disrupting radar frequencies:** *20.05% strontium nitrate, 14.32% curium metal, 14.32% cesium metal powder, 14.32% powdered sugar, 11.46% anhydrous aluminum nitrate, 11.46% hexachloroethane, 5.73% beryllium hydride, 4.29% zinc dust, 2.86% diethylamine hydrochloride, 1.14% copper-II-chromite, 0.05% balance*
19. 06-06-016A:Pyrotechnic composition for disrupting radio frequencies: *16.89% potassium chlorate, 16.89% tantalum sulfide, 15.2% potassium permanganate, 13.51% powdered sugar, 13.51% powdered bismuth, 10.13% yttrium nitrate, 8.44% iron-III-bromide, 3.37% powdered aluminum, 2.02% copper-II-iodide, 0.04% residual balance*	**20. 06-06-017A:Smoke composition for confusing lasers and radio frequencies:** *15.78% potassium chlorate, 15.78% powdered bituminous coal, 15.78% ammonium chloride, 13.15% anhydrous magnesium nitrate, 10.52% starch, 9.21% uranyl nitrate, 7.89% calcium sulfide, 7.89% strontium nitrate, 2.63% red phosphorus, 1.31% antimony pentasulfide, 0.06 mixed balance*
21. 06-06-018A: Anti-laser and anti-communication composition: *23.33% strontium nitrate, 16.66% rubidium-I-iodide, 13.33% potassium dichromate, 13.33% red phosphorus, 10% radium metal flake, 8.33% rhenium metal flake, 6.66% mercury-II-thiosulfate, 5% barium oxide, 3.33% soft wood charcoal, 0.03% mixed balance*	**22. 06-06-019A: Smoke composition for concealing against thermal and infrared imaging systems:** *38.70% sodium nitrate, 19.35% red phosphorus, 12.9% powdered bismuth, 12.9% powdered sugar, 9.67% zinc phosphide, 6.45% cesium chloride, 0.03% balance*
23. 06-06-020A: Specialty flash powder for harassing thermal imaging devices: *22.59% potassium chlorate, 21.46% silver nitrate, 16.94% red phosphorus, 13.55% anhydrous aluminum chloride, 10.16% silver-I-iodide, 9.03% dimethylpyrone methyl perchlorate, 6.21% nitrocellulose, 0.06% mixed residual balance*	

06-06-001A: "EMP" generating composition suitable for disabling electronic devices and communications:
To prepare a simple lab batch, place into a suitable mixing bowl or blender, equipped with a plastic stir blade, 250 milliliters of hexane, followed by ***72 grams of standard powdered silicon,*** followed by ***6 grams of diatomaceous earth,*** followed by ***140 grams of standard powdered magnesium,*** and then rapidly blend the mixture for about 30 minutes to form a uniform mass. After stirring for 30 minutes, add in 50 milliliters of additional hexane, followed by ***430 grams of strontium nitrate,*** followed by ***260 grams of plutonium-VI-oxide,*** followed by ***260 grams of cesium nitrate,*** and then continue to rapidly blend the mixture on moderate speed until nearly all the hexane has evaporated and small granules of the composition remain. Thereafter, place the almost dried granules onto a shallow pan, and allow them to thoroughly dry. Thereafter, place the dry granules into a clean beaker, or mixing bowl, equipped with motorized stirrer utilizing a standard plastic stir blade, and then add in ***56 grams of thorium fluoride,*** followed by ***67 grams of thorium oxide,*** followed by ***34 grams of EPON 815 standard epoxy resin***, followed by ***45 grams of kraton polymer binder***, and then blend the mixture on high speed for about 10 to 30 minutes at room temperature. Afterwards, the mixture is ready to be used. To use the composition, it needs to be poured and pressed into any desirable flare container, tube or similar body and then vibrated to remove any potential air bubbles, and then allowed to cure at room temperature for several days. **Note:** For use in anti-aircraft munitions, the blended mixture should be poured and pressed and vibrated into flare bodies of 40 millimeters in diameter by 300 millimeters in length (on average). For use in disabling electronic devices on the battlefield, or equivalent, the mixture should be poured and pressed and vibrated into any desirable container, tube, ect.. In either case, the munitions should be cured for several days, and should be initiated using any standard flare igniter composition. For use in disabling electronic devices on the battle field or equivalent, grenade bodies or similar containers of up to 120 millimeters in diameter can be used, and these grenades should be ignited using standard smoke grenade ignition fuzes. For maximum effect against helicopters and other low flying aircraft, and for disabling communications on the battle field, flare bodies of 90 to 120 millimeters by 300 millimeters in length should be used, and these flares should be equipped with parachutes. These devices can be fired from mortars, artillery pieces, or fired from shoulder fired rockets, ect., ect., For maximum effect against low high flying aircraft, the composition should be poured and pressed and vibrated into molds of 130 to 160 millimeters in diameter by 300 to 1200 millimeters in length, and said molded mixture cured for several days, and then the cured molded mixture should be placed into missiles casings and fired accordingly. The warheads should obviously contain a parachute. These missiles can be used to propel the composition to any desirable altitude, accordingly to any suitable missile design. As with other devices, the EMP charge should be ignited using any standard smoke grenade ignition compositions. **Second note**: Obviously this procedure is experimental and has not been thoroughly tested. It is however, designed to emphasize new ideas in the field of pyrotechnics to create new anti-aircraft capabilities, and for creating new and interesting weapons for the battlefield. EMP fields, depending on the severity and frequency, can be used to completely disable communications and even electronic devices. Tests have shown that proper EMP fields, within close proximity to, have been able to shoot down aircraft by shorting out critical electronic devices on board. However, it should be kept in mind that most modern high performance aircraft may be equipped with anti-EMP materials to protect vital electronic components, so this should be kept in mind when experimenting with such pyrotechnic compositions.

Second process for use: Instead of igniting the pyrotechnic mixture using standard igniters, the pyrotechnic mixture can be poured and pressed into any desirable bomb casing, missile casing, shell, container, tube, mold, ect., and then allowed to cure, and then a TATB booster charge can be pressed in, inserted in, or the like, and said TATB High explosive charge can be connected to any standard RDX blasting cap or detonator, and said munition can be detonated on or around the target. In this regards, the object is to propel the pyrotechnic mixture using any suitable means such as artillery, mortars, grenades, rockets, missiles, ect., to the target, whereby the munition is detonated in very close proximity to the target, using the RDX blasting cap/detonator and corresponding TATB charge, and ultimately the object, or idea, is to initiate an EMP force field similar to the ones generated by the detonation of a nuclear weapon whereby to disable communications and electronic devices. These EMP fields can be used to hamper with, disable, or cause to crash, any flying aircraft, specifically highflying, high performance, state of the art fighter jets and bombers. Also, ground munitions, such as mines or rocket warheads and the like, can be generated to disable ground vehicles, tanks, ect., by hampering with communications.

Final note: in all cases, the material used to make up the container, flare body, tube, ect., should be made of lead, boron, or other radiation shielding materials. **Special note:** This procedure should be carried out in well-shielded areas as it contains harmful radioactive materials. Note: Obviously, possession of plutonium without proper license is a federal offense.

Burn rate: Moderate.
Water resistance: Very good.
Stability: Should be used within 50 years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Moderate.
Percentage: ***31.3% strontium nitrate, 18.9% plutonium-VI-oxide, 18.9% cesium nitrate, 10.2% magnesium, 5.2% silicon, 4.8% thorium oxide, 4% thorium fluoride, 3.2% "Kraton" binder, 2.4% EPON 815 epoxy resin, 0.43% diaotmacous earth, 0.67% residue***
Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).
Use: Potential composition for preparing anti-aircraft, anti-communications, and anti-electronic munition systems.
Note: this composition has not been thoroughly tested, and numerous modifications exist.

06-06-002A: Anti-radar pulsar used to confuse and scramble radar frequencies:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***75 grams of thorium fluoride***, followed by ***55 grams of uranium dioxide***, followed by ***250 grams of titanium hydride***, followed by ***150 grams of calcium carbide***, and then followed by 150 milliliters of ether. Thereafter, tumble the mixture at 250 RPM until the bulk of the ether evaporates. A gentle vacuum can be used to collect the ether. Thereafter, add in ***450 grams of uranyl nitrate***, followed by ***400 grams of dry sodium nitrate***, and then followed by ***50 grams of bismuth trioxide***. Thereafter, add in 150 milliliters of acetone, and then continue to tumble the mixture at 250 RPM until all the acetone evaporates. When this point is achieved, continue to tumble the mixture at 250 RPM for about 30 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tubes, flare bodies, or similar containers under a pressure of 15,000 psi in the usual means. Flare design may vary, and different designs may lead to different results. Note: the devices can be used by ground vehicles and aircraft. Second note: there are numerous modifications to this process. Warning: use proper shielding when assembling this composition to avoid any potential radiation hazards. Should be ignited using a proper ignition composition.
Burn rate: Slow.
Water resistance: Acceptable.
Stability: Should be used within 50 years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***31.46% uranyl nitrate, 27.97% sodium nitrate, 17.48% titanium hydride, 10.48% calcium carbide, 5.24% thorium fluoride, 3.84% uranium dioxide, 3.49% bismuth trioxide, 0.04% balance***
Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).
Use: Potential composition for disrupting radar frequencies.

06-06-003A: Radar antagonist & anti-communication composition for confusing and disrupting radio frequencies of various intensity:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***560 grams of potassium permanganate***, followed by 400 milliliters of hexane. Thereafter, add in ***350 grams of manganese dioxide***, followed by ***250 grams of aluminum nitride***, followed by ***200 grams of tantalum sulfide***, followed by ***80 grams of lithium metal***, followed by ***90 grams of calcium metal***, followed by ***400 grams of rubidium oxide***, and then followed by ***130 grams of rubidium metal***. Thereafter, blend the mixture on moderate speed until the solvent evaporates—note: you must use a vacuum to remove the solvent and de-gas the mixture. Thereafter, place the dried mass into an airtight ball mill, filled with 400 grams of Teflon coated steel shot of 10 millimeters in diameter, and then tumble the mixture on moderate speed for about 1 hour. Note: maintain an inert atmosphere during the tumbling process. Thereafter, place the tumbled mass into a secure mixing bowl, equipped with a clean motorized stirrer, and then add in ***75 grams of any standard liquid epoxy resin***, and then blend the mixture on moderate speed for about 10 minutes. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable flare body, container, tube, ect., in the usual manner, and then allowed to cure at room temperature in a desiccator filled with sodium hydride for 48 hours or more. Note: requires proper ignition composition for proper burn. Note: if desired, a small high explosive bursting charge can be fitted in the center of the flare—for bursting the device at any desirable location to form a fog.
Burn rate: Slow.
Water resistance: Acceptable.
Stability: Should be used within 50 years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: Can explode under severe conditions.
Percentage: ***26.22% potassium permanganate, 18.73% rubidium oxide, 16.39% manganese dioxide, 11.70% aluminum nitride, 9.36% tantalum sulfide, 6% rubidium metal, 4.21% calcium metal, 3.74% lithium metal, 3.51% epoxy resin, 0.14% impurities***
Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).
Use: Potential composition for disrupting radar and communication frequencies.

06-06-004A: Anti-radar composition for generating a smoke screen for confusing and disrupting laser waves:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***600 grams of finely powdered sugar***, followed by ***350 grams of red phosphorus***, followed by ***120 grams of iron powder***. Thereafter, add in 300 milliliters of acetone, and then blend the mixture for about 15 minutes. Thereafter, add in ***350 grams of sodium nitrate***, followed by ***75 grams of anhydrous rubidium-I-chloride***, followed by ***50 grams of rubidium sulfide***, and then followed by ***150 grams of finely divided rubidium metal***. Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 150 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed under high pressure into any desirable flare body, container, mold, ect., in the usual manner. A suitable ignition composition should be used to initiate proper burn.
Burn rate: Slow.
Water resistance: Acceptable.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35.39% sugar, 20.64% red phosphorus, 20.64% sodium nitrate, 8.84% rubidium metal, 7% iron, 4.42% rubidium-I-chloride, 2.94% rubidium sulfide, 0.13% mixed balance***
Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).
Use: Potential composition for generating a smoke screen for disrupting laser waves.

06-06-005A: EMP/EMF composition for disrupting communications and electronic devices:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***540 grams of potassium permanganate***, followed by ***120 grams of calcium sulfide***, followed by ***90 grams of Iron-II-oxide***, followed by ***100 grams of tantalum sulfide.*** Thereafter, add in 250 milliliters of ether, and then blend the mixture for about 10 minutes. Thereafter, add in ***50 grams of plutonium-IV-oxide***, followed by ***55 grams of radium-II-bromide (anhydrous)***, followed by ***250 grams of finely divided radium metal***, and then followed finally by ***45 grams of finely divided beryllium metal***. Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 150 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed under high pressure into any desirable mold (leaving a central hollow gap to allow for a bursting charge) utilizing a pressure of about 10,000 psi. A standard high explosive bursting charge should be inserted there into to properly fragment the composition upon detonation. Note: use proper shielding facilities when carrying out this process to protect against radiation hazards. Note: the device can be explodes on the ground, or in the air.
Burn rate: Slow.
Water resistance: Acceptable.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: May explode but under severe conditions only.
Percentage: ***43.2% potassium permanganate, 20% radium metal, 9.6% calcium sulfide, 8% tantalum sulfide, 7.2% iron-II-oxide, 4.4% radium-II-bromide, 4% plutonium-IV-oxide, 3.6% beryllium metal***
Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).
Use: Potential composition for generating a particle screen for disrupting communications and electronic devices.

06-06-006A: EMP/EMF composition for generating a fog for disrupting communications and electronic devices:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual manner, place ***450 grams of potassium iodate***, followed by ***95 grams of red phosphorus***, followed by ***190 grams of sugar***, followed by ***50 grams of uranium dioxide.*** Thereafter, add in 350 milliliters of hexane, and then blend the mixture for about 10 minutes. Thereafter, add in ***55 grams of plutonium-IV-oxide***, followed by ***75 grams of arsenic trioxide***, followed by ***100 grams of lead dioxide,*** followed finally by ***45 grams of finely divided beryllium metal***. Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 150 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed under high pressure into any desirable flare cartridge, container, tube, ect., under a pressure of about 10,000 psi. A standard ignition composition should be used for proper initiation. Note: use proper shielding facilities when carrying out this process to protect against radiation hazards.
Burn rate: Moderate.
Water resistance: Moderate.
Stability: Should be used within 75 years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: May explode but under severe conditions only.
Percentage: ***42.45% potassium iodate, 17.92% sugar, 9.43% lead dioxide, 8.96% red phosphorus, 7% arsenic trioxide, 5.18% plutonium-IV-oxide, 4.71% uranium dioxide, 4.24% beryllium metal, 0.11% impurities***
Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).

Use: Potential composition for generating a fog for disrupting communications and electronic devices.

06-06-007A: EMP/EMF composition for generating a cloud of particles to disrupt communications:

Into a suitable empty ball mill, place ***350 grams of potassium iodate***, followed by ***60 grams of potassium dichromate***, followed by ***150 grams of red phosphorus***, followed by ***100 grams of sugar***, followed by ***120 grams of finely ground Teflon***, followed by ***120 grams of uranyl nitrate***, followed by ***150 grams of sodium nitrate***, followed by ***150 grams of finely divided rubidium metal***, followed by ***150 grams of thorium fluoride***, and then add in ***200 grams of aluminum flake*** of average commercial availability, and then tumble the mixture at 75 RPM for about 2 hours to form a uniform powder. Thereafter, the mixture is ready for use. To use, the powder needs to be placed loosely into any desirable grenade body, bomb casing, container, tube, ect., and a black powder bursting charge then attached thereto to cause the powdered mixture to expand upon explosion of the bursting charge. The device can be exploded on the ground or in the air, but preferably in the air.

Burn rate: N/A.

Water resistance: Moderate.

Stability: Should be used within 75 years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***22.58% potassium iodate, 12.9% aluminum flake, 9.67% red phosphorus, 9.67% sodium nitrate, 9.67% rubidium metal, 9.67 thorium fluoride, 7.74% Teflon, 7.74% uranyl nitrate, 6.45% sugar, 3.87% potassium dichromate, 0.04% balance***

Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).

Use: Potential composition for generating a particle screen for disrupting communications and electronic devices.

06-06-007B: EMP/EMF composition for generating a cloud of particles to disrupt communications:

Into a suitable empty ball mill, place ***400 grams of calcium phosphide***, followed by ***120 grams of calcium silicide***, followed by ***90 grams of red phosphorus***, followed by ***300 grams of potassium permanganate***, followed by ***50 grams of finely ground Teflon***, followed by ***230 grams of uranyl nitrate***, followed by ***175 grams of finely divided rubidium metal***, followed by ***250 grams of thorium fluoride***, and then add in ***200 grams of zinc flake*** of average commercial availability, and then tumble the mixture at 75 RPM for about 2 hours to form a uniform powder. Thereafter, the mixture is ready for use. To use, the powder needs to be placed loosely into any desirable grenade body, bomb casing, container, tube, ect., and a black powder bursting charge then attached thereto to cause the powdered mixture to expand upon explosion of the bursting charge. The device can be exploded on the ground or in the air, but preferably in the air.

Burn rate: N/A

Water resistance: Good.

Stability: Should be used within 75 years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***22% calcium phosphide, 16.52% potassium permanganate, 13.77% thorium fluoride, 12.67% uranyl nitrate, 11% zinc flake, 9.64% rubidium metal, 6.61% calcium silicide, 4.95% red phosphorus, 2.75% Teflon, 0.09% balance***

Classification: Deflagrating explosive (classified as radioactive specialty pyrotechnic mixture).

Use: Potential composition for generating a particle screen for disrupting communications and electronic devices.

06-06-008A: Laser antagonist compound containing dark green pulsar:

Into a suitable mixing bowl, equipped with any style of motorized stirrer, place 250 milliliters of acetone, and then followed by ***140 grams of mercury-II-chloride***, followed by ***450 grams of potassium chlorate***, followed by ***55 grams of tantalum sulfide***, followed by ***120 grams of red phosphorus***, followed by ***250 grams of sugar***, and then followed by ***35 grams of copper-II-oxide***. Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-dry mass onto a shallow pan or tray, and then allow the mass to thoroughly air-dry. Once it has, place the dried mass into a suitable ball mill, filed with 150 grams of Teflon coated steel shot of the usual manner, and then tumble the mixture at 150 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any suitable flare body, container, tube, mold, under a pressure of about 10,000 psi in the usual manner. A magnesium ignition composition should be used for proper ignition.

Burn rate: 0.09 inches per second on average (depends on pressing).

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 4 ¾

Ease of ignition (1 to 10): 4+

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***42.85% potassium chlorate, 23.8% sugar, 13.33% mercury-II-chloride, 11.42% red phosphorus, 5.23% tantalum sulfide, 3.33% copper-II-oxide, 0.04% impurities***

Classification: Deflagrating explosive.

Use: Potential composition for generating a smoke screen for disrupting laser guided weapons.

06-06-009A: Flash to bang pyrotechnic composition (with smoke) for spotting:

Into a suitable mixing bowl, equipped with a motorized stirrer, place 250 milliliters of acetone, and then followed by ***75 grams of 95+ sodium peroxide***, followed by ***325 grams of potassium permanganate***, followed by ***120 grams of flakes magnesium (average commercially availability)***, followed by ***450 grams of dry ammonium chloride***, followed by ***200 grams of dry sodium chlorate***, and then followed by ***300 grams of fine grained sodium hypophosphite***. Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any suitable fiber or cardboard body container, ect., under a pressure of about 10,000 psi in the usual manner.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Unknown—may explode upon ignition or if not pressed properly.

Percentage: ***30.61% ammonium chloride, 22.1% potassium permanganate, 20.4% sodium hypophosphite, 13.6% sodium chlorate, 8.16% magnesium flake, 5.1% sodium peroxide, 0.03% balance***

Classification: Deflagrating explosive.

Use: Potential composition for generating a flash followed by a bang (with smoke) for use in spotting and other similar activities.

Note: Any composition containing ammonium chloride and a chlorate is subject to caution—use caution when handling this mixture.

06-06-009B: Flash to bang pyrotechnic composition (with increased smoke) for spotting:

As in the previous example, into a suitable mixing bowl, equipped with a motorized stirrer, place 175 milliliters of ether, and then add in ***175 grams of 95+ sodium peroxide***, followed by ***189 grams of potassium permanganate***, followed by ***90 grams of flaked magnesium (average commercial availability)***, followed by ***450 grams of dry ammonium chloride***, followed by ***300 grams of dry sodium chlorate***, followed by ***25 grams of carbon black***, and then followed by ***190 grams of fine grained red phosphorus***. Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any suitable fiber or cardboard body container, ect., under a pressure of about 10,000 psi in the usual manner, and then cure the munitions at room temperature for several days.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Unknown—may explode upon ignition or if not pressed properly.

Percentage: ***31.71% ammonium chloride, 21.14% sodium chlorate, 13.38% red phosphorus, 13.31% potassium permanganate, 12.33% sodium peroxide, 6.34% magnesium flake, 1.76% carbon black, 0.03% balance***

Classification: Deflagrating explosive.

Use: Potential composition for generating a flash followed by a bang (with smoke) for use in spotting and other similar activities.

Note: Any composition containing ammonium chloride and a chlorate is subject to caution—use caution when handling this mixture.

06-06-010A: Pyrotechnic composition for producing radioactive smoke for disrupting communications:

Into a suitable empty ball mill, place ***160 grams of thorium fluoride***, followed by ***300 grams of sodium chlorate***, followed by ***125 grams of red phosphorus***, and then followed by ***100 grams of potassium dichromate***. Thereafter, tumble the mixture on low RPM for about 2 hours. Thereafter, into a clean beaker or similar container, place 125 milliliters of 95% ethyl alcohol, and then add in ***45 grams of fine grained PVC, 25 grams of carbon black, 500 grams of ammonium chloride, 175 grams of uranium dioxide***, and then followed by ***200 grams of powdered sugar***. Thereafter, rapidly blend the mixture for about 30 minutes at room temperature. Thereafter, add in the dry tumbled mixture prepared in the beginning, and then continue to blend the entire mass for about 1 hour on high speed. Thereafter, the mixture is ready to be pressed. To do so, press the mixture into a desired container, tube, mold, or any other similar body under high pressure, and then cure the devices at room temperature for several days.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.
Explosive ability: Unknown.
Percentage: ***30.67% ammonium chloride, 18.4% sodium chlorate, 12.26% sugar, 10.73% uranium dioxide, 9.81% thorium fluoride, 7.66% red phosphorus, 6.13% potassium dichromate, 2.76% PVC, 1.53% carbon black, 0.05% residue***
Classification: Deflagrating explosive.
Use: Potential composition for generating a radioactive smoke for disrupting communications.
Note: Any composition containing ammonium chloride and a chlorate is subject to caution—use caution when handling this mixture.

06-06-011A: Laser antagonist pyrotechnic composition for disrupting laser-guided munitions (un-tested):

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of the usual diameter, place ***45 grams of chromium-III-chloride***, followed by ***150 grams of glucose***, followed by ***120 grams red phosphorus***, followed by ***50 grams of magnesium phosphide***, followed by 5 milliliters of mineral oil. Thereafter, tumble the mixture for about 30 minutes at 75 RPM. Thereafter, separate the mixture using a screen (in the usual manner), and then place it into a suitable mixing bowl or similar container, equipped with motorized stirrer, and then add in 75 milliliters of ether, followed by 75 milliliters of acetone, and then blend the mixture for about 5 minutes at moderate speed. Now, add in ***70 grams of ammonium chloride***, followed by ***75 grams of arsenic trioxide***, followed by ***150 grams of cadmium metal*** (finely divided), followed by ***200 grams of cesium fluoride***, followed by ***15 grams of copper chromite***, and then followed by ***750 grams of potassium nitrate***, and then blend the mixture to form a dough like material. Thereafter, place the mixture onto a shallow pan or tray, and then allow the mixture to thoroughly dry (just the solvents). Thereafter, place the mixture into a clean ball mill, filled with 250 grams of heavy Teflon coated steel shot, and then tumble the mixture for about 30 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture should be pressed into tablets, rods, or discs, of any desired diameter (preferably at least 40 millimeter by 40 milliliter), under a pressure of 15,000 psi in the usual manner. A strong ignition composition such as a magnesium ignition composition should be used for proper ignition.
Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Not likely.
Percentage: ***46.15% potassium nitrate, 12.3% cesium fluoride, 9.23% cadmium metal, 9.23% glucose, 7.38% red phosphorus, 4.61% arsenic trioxide, 4.3% ammonium chloride, 3.07% magnesium phosphide, 2.76% chromium-III-chloride, 0.92% copper chromite burn catalyst, 0.05% balance***
Classification: Deflagrating explosive.
Use: Potential composition for generating an anti-laser smoke.

06-06-011B: Laser antagonist pyrotechnic composition for disrupting laser-guided munitions (un-tested):

Into a suitable air-tight mixing drum, equipped with motorized stirrer, and utilizing an inert atmosphere, place 150 milliliters of hexane, followed by ***250 grams of white phosphorus***, followed by 75 milliliters of toluene, and then blend the mixture for about 15 minutes under an inert atmosphere at room temperature. Thereafter, add in ***65 grams of myristic acid***, followed by ***75 grams of finely ground boron metal***, followed by ***120 grams of magnesium sulfide***, and then continue to blend the mixture for about 30 minutes. Thereafter, add in ***500 grams of uranyl nitrate***, followed by ***15 grams of ferric arsenite***, and then followed by ***50 grams of hexamine***. Thereafter, continue to blend the mixture for about 30 minutes. Now, apply a vacuum to the mixture and suck out all the liquid components. Once the mixture has been vacuumed dried, it is ready for pressing. To do so, simply press the mixture into any desirable grenade body, tube, flare, ect., under high pressure in the usual manner, but use an inert atmosphere to protect the white phosphorus from the air. Should be ignited using a suitable magnesium ignition composition.
Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Not likely.
Percentage: ***46.51% uranyl nitrate, 23.25% white phosphorus, 11.16% magnesium sulfide, 6.97% boron metal, 6.04% myristic acid, 4.65% hexamine, 1.39% ferric arsenite burn catalyst, 0.03% impurities***
Classification: Deflagrating explosive.
Use: Potential composition for generating an anti-laser smoke (disrupts laser guided weapons).

06-06-012A: Anti-thermal imaging composition for confusing and disrupting thermal imaging systems:

Into a suitable empty ball mill, place ***90 grams of powdered silicon carbide***, followed by ***85 grams of bismuth trioxide (Bi2O3)***, followed by ***55 grams of black phosphorus***, followed by ***150 grams of magnesium peroxide***, followed by ***90 grams of osmium

dioxide***, followed by ***175 grams of zirconium hydride***, and then followed by ***120 grams of potassium picrate***. Thereafter, tumble the mixture at 150 RPM for about 1 hour in the absence of air. Note: use a nitrogen purge system to exclude air and moisture. Thereafter, place the tumbled mixture into any suitable mixing bowl, blender, or vertical mixer, equipped with motorized stirrer, and then add in 350 milliliters of dry hexane. Thereafter, add in ***100 grams of gallium arsenide***, followed by ***95 grams of rubidium metal***, and then followed by ***350 grams of silver nitrate***. Thereafter, blend the mixture on moderate speed for about 1 hour in the absence of air. As in the previous tumbling mixture, use a nitrogen purge system to exclude air and moisture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable tube, container, mold, flare body, ect., under a pressure of about 5,000 psi. Thereafter, allow the munitions to cure in a vacuum dessicator equipped with nitrogen purge system to exclude air and moisture. If desired, the mixture can be pressed into tablets or pellets, and then fitted to a canister equipped with a central bursting charge for dispersing the agent upon detonation to form a cloud.
Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years if kept away from moisture and air.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Stable
Percentage: ***28.8% silver nitrate, 14.4% zirconium hydride, 12.34% magnesium peroxide, 9.87% potassium picrate, 8.23% gallium arsenide, 7.4% osmium dioxide, 7.4% silicon carbide, 6.99% bismuth trioxide, 4.52% black phosphorus, 0.05% mixed residual balance***
Classification: Deflagrating explosive.
Use: Potential composition for disrupting thermal imaging systems.

06-06-013A: Anti-thermal imaging composition for confusing and disrupting thermal imaging systems:

Into a suitable mixing drum or similar container, equipped with motorized stirrer in the usual manner, place ***100 grams of beryllium oxide***, followed by ***75 grams of dry aluminum citrate***, followed by ***150 grams of Cerium-III-nitrate***, followed by ***500 grams of magnesium perchlorate***, and then followed by 250 milliliters of hexane. Thereafter, blend the mixture for about 20 minutes. Thereafter, add in ***100 grams of Cesium-I-iodide***, followed by ***150 grams of Cesium flake***, followed by ***25 grams of potassium dichromate***, and then followed by ***75 grams of copper-II-nitrate trihydrate***, and then continue to blend the mixture for about 30 minutes. Note: more hexane may need to be added to maintain consistency. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly dry. Once it has, place the mixture into a suitable ball mill, filled about 100 grams of heavy Teflon coated steel shot, and then tumble the mixture at about 75 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, simply press he mixture into any desirable flare body, tube, container, grenade,. ect., under a pressure of about 10,000 psi. An ignition composition should be used for proper ignition and burn.
Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Not likely.
Percentage: ***42.55% magnesium perchlorate, 12.76% cerium-III-nitrate, 12.76% cesium flake, 8.51% cesium-I-iodide, 8.51% beryllium oxide, 6.38% aluminum citrate, 6.38% copper-II-nitrate trihydrate, 2.12% potassium dichromate, 0.03% impurities***
Classification: Deflagrating explosive.
Use: Potential composition for disrupting thermal imaging systems.

06-06-014A: Pyrotechnic composition for generating a radioactive smoke for disrupting communications:

Into a suitable empty ball mill, place ***340 grams of potassium chlorate***, followed by ***30 grams of sodium acetate***, followed by ***900 grams of cesium***^{137}***-I-iodide***, and then followed by 150 milliliters of hexane. Thereafter, tumble the mixture at 150 RPM for about 1 hour in the absence of air and moisture. Thereafter, place this mixture into a suitable mixing drum, equipped with motorized stirrer, and then add in ***250 grams of antimony trisulfide***, followed by ***200 grams of red phosphorus***, and then finally by ***400 grams of potassium dichromate***. Thereafter, blend the mixture on moderate speed for about 1 hour in the absence of air and moisture. Thereafter, the mixture is ready for use. To use, simple press the material into any desired flare body, tube, ect., under high pressure and the cure in a vacuum oven at ordinary temperature. Note: proper shielding should be used to protect against radiation hazards.
Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.

Explosive ability: Stable

Percentage: *42.45% cesium^{137}-iodide, 18.86% potassium dichromate, 16.03% potassium chlorate, 11.79% antimony trisulfide, 9.43% red phosphorus, 1.41% sodium acetate, 0.03% mixed balance*

Classification: Deflagrating pyrotechnic composition.

Use: Potential composition for disrupting communications—specifically single side band frequencies ranging from 100 to 600 megahertz frequency range.

06-06-015A: Radioactive pyrotechnic compositions for flares to produce a smoke for disrupting radar frequencies:

Into a suitable mixing bowl, equipped with motorized stirrer, place 500 milliliters of hexane, and then add in ***500 grams of Curium^{242} metal flake***, followed by ***700 grams of strontium nitrate***, followed by ***200 grams of beryllium hydride***, followed by ***500 grams of powdered sugar***, followed by ***40 grams of copper-II-chromite***, followed by ***400 grams of hexachloroethane***, followed by ***150 grams of zinc dust***, followed by ***400 grams of anhydrous aluminum nitrate***, and then blend the mixture on high speed in the absence of air and moisture for about 30 minutes. Thereafter, add in 300 milliliters of acetone, followed by ***100 grams of diethylamine hydrochloride***, and then followed by ***500 grams of cesium metal powder***, and then continue to blend the mixture for about 50 additional mixtures. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desired flare body, grenade body, tube, ect., under high pressure and then cured in an oven at ordinary temperature. Prime with magnesium based ignition compositions. If desired, the mixture can be used in burster type munitions. Note: proper shielding facilities must be used to protect against radiation hazards. Note: flare bodies and similar containers should be Lead lined, or Boron lined.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable

Percentage: *20.05% strontium nitrate, 14.32% curium metal, 14.32% cesium metal powder, 14.32% powdered sugar, 11.46% anhydrous aluminum nitrate, 11.46% hexachloroethane, 5.73% beryllium hydride, 4.29% zinc dust, 2.86% diethylamine hydrochloride, 1.14% copper-II-chromite, 0.05% balance*

Classification: Radioactive deflagrating pyrotechnic composition.

Use: Potential composition for disrupting radar frequencies.

06-06-016A:Pyrotechnic composition for disrupting radio frequencies:

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***500 grams of potassium chlorate***, followed by ***400 grams of powdered sugar***, and then followed by ***100 grams of powdered aluminum***. Thereafter, tumble the mixture at 250 RPM for about 2 hours. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, in the usual means, and then add in 500 milliliters of acetone, and then add in ***450 grams of potassium permanganate***, followed by ***500 grams of tantalum sulfide***, followed by ***250 grams of iron-III-bromide*** (anhydrous), and then followed by ***300 grams of yttrium nitrate***. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, add in ***60 grams of copper-II-iodide***, and then followed by ***400 grams of powdered bismuth***. Thereafter, blend the mixture for an additional 30 minutes. Note: more solvent may or may not be needed. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired flare body, and then cured in an oven or at room temperature in the usual manner. A suitable ignition composition should be used for proper burn.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable

Percentage: *16.89% potassium chlorate, 16.89% tantalum sulfide, 15.2% potassium permanganate, 13.51% powdered sugar, 13.51% powdered bismuth, 10.13% yttrium nitrate, 8.44% iron-III-bromide, 3.37% powdered aluminum, 2.02% copper-II-iodide, 0.04% residual balance*

Classification: Radioactive deflagrating pyrotechnic composition.

Use: Potential composition for confusing radio frequencies.

06-06-017A:Smoke composition for confusing lasers and radio frequencies:

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***600 grams of potassium chlorate***, followed by ***600 grams of powdered bituminous coal***, followed by ***100 grams of powdered red phosphorus***, and then followed by ***50 grams of antimony pentasulfide***. Thereafter, tumble the mixture at 75 RPM for about 3 hours. Thereafter, place the tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, in the usual means, and then add in 1000 milliliters of hexane, and then add in

300 grams of strontium nitrate, followed by ***400 grams of starch***, followed by ***300 grams of calcium sulfide***, followed by ***500 grams of anhydrous magnesium nitrate***, followed by ***600 grams of ammonium chloride***, and then followed by ***350 grams of uranyl nitrate***. Thereafter, blend the mixture on moderate speed for about 30 minutes. Note: more solvent may or may not be needed. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired smoke pot, grenade body, tube, container, ect., and then cured in an oven or at room temperature in the usual manner. A suitable ignition composition should be used for proper burn.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable

Percentage: *15.78% potassium chlorate, 15.78% powdered bituminous coal, 15.78% ammonium chloride, 13.15% anhydrous magnesium nitrate, 10.52% starch, 9.21% uranyl nitrate, 7.89% calcium sulfide, 7.89% strontium nitrate, 2.63% red phosphorus, 1.31% antimony pentasulfide, 0.06 mixed balance*

Classification: Deflagrating pyrotechnic composition.

Use: Potential composition for generating a smoke to confuse laser guided weapons, and possibly for confusing radio frequencies.

06-06-018A: Anti-laser and anti-communication composition:

Into a suitable ball mill, filled with 350 grams of Teflon coated steel shot, place ***400 grams of potassium dichromate***, followed by ***500 grams of rubidium-I-iodide***, followed by ***100 grams of soft wood charcoal***, and then tumble the mixture at 500 RPM for about 2 hours. Now, in the meantime, into a separate ball mill, filled with 350 grams of Teflon coated steel shot, place ***400 grams of red phosphorus***, followed by ***250 grams of Rhenium metal flake***, followed by ***700 grams of strontium nitrate***. Thereafter, tumble the mixture at 75 RPM for 1 hour. After tumbling both mixtures, place both mixtures into a suitable mixing drum, equipped with motorized stirrer, such as a Sigma blade mixer, and then add in 700 milliliters of hexane, and then add in ***150 grams of barium oxide***, followed by ***200 grams of mercury-II-thiosulfate***, and then followed by ***300 grams of radium metal flake***. Thereafter, blend the entire mixture for about 1 hour at moderate temperature. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desired flare body, tube, ect., under high pressure, and then cure the munitions in an oven at moderate temperature. Prime with any magnesium based mixture.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable

Percentage: *23.33% strontium nitrate, 16.66% rubidium-I-iodide, 13.33% potassium dichromate, 13.33% red phosphorus, 10% radium metal flake, 8.33% rhenium metal flake, 6.66% mercury-II-thiosulfate, 5% barium oxide, 3.33% soft wood charcoal, 0.03% mixed balance*

Classification: Deflagrating pyrotechnic composition.

Use: Potential composition for generating a smoke to confuse laser guided weapons, and possibly for confusing radio frequencies.

06-06-019A: Smoke composition for concealing against thermal and infrared imaging systems:

Into a suitable mixing bowl, equipped with motorized stirrer, place ***400 grams of finely powdered bismuth***, followed by ***600 grams of red phosphorus***, followed by ***200 grams of cesium chloride***, followed by ***400 grams of powdered sugar***, followed by ***300 grams of zinc phosphide***, and then followed by ***1200 grams of sodium nitrate***. Thereafter, add in 800 milliliters of acetone, and then blend the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desired smoke pot, grenade, tube, container, ect., under high pressure, and then cure the mixture in an oven at low temperature. Prime with the usual composition.

Burn rate: N/A.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable

Percentage: *38.70% sodium nitrate, 19.35% red phosphorus, 12.9% powdered bismuth, 12.9% powdered sugar, 9.67% zinc phosphide, 6.45% cesium chloride, 0.03% balance*

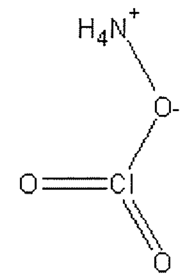
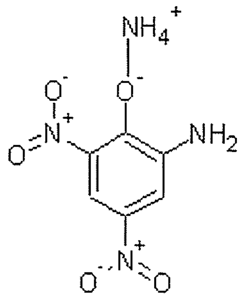
Classification: Deflagrating pyrotechnic composition.

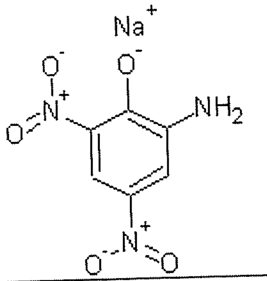
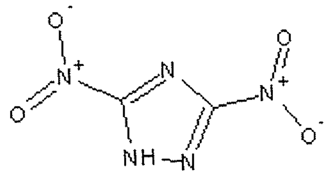
Use: Potential composition for generating a smoke for concealing.

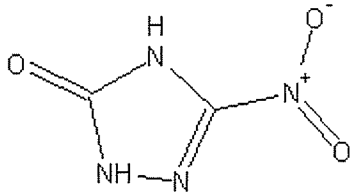
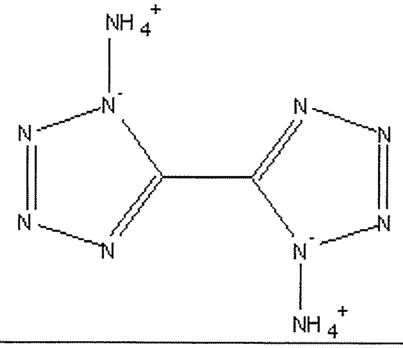
06-06-020A: Specialty flash powder for harassing thermal imaging devices:
Into a suitable ball mill or vertical mixer, place ***190 grams of silver nitrate***, followed by ***80 grams of dimethylpyrone methyl perchlorate***. Thereafter tumble or rotate the mixture at 150 RPM for about 30 to 40 minutes. Thereafter, place this tumbled mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***200 grams of potassium chlorate***, followed by ***55 grams of nitrocellulose***, followed by ***90 grams of silver-I-iodide***, followed by hafnium dioxide, followed by ***150 grams of red phosphorus***, and then followed by ***120 gram of anhydrous aluminum chloride***. Thereafter, add in 300 milliliters of dry hexane, and then blend the mixture in the absence of air and moisture for about 50 minutes. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into any desirable flare body, tube, container, ect., under a pressure of about 5,000 psi, and then cure in a vacuum oven to exclude moisture and air.
Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *22.59% potassium chlorate, 21.46% silver nitrate, 16.94% red phosphorus, 13.55% anhydrous aluminum chloride, 10.16% silver-I-iodide, 9.03% dimethylpyrone methyl perchlorate, 6.21% nitrocellulose, 0.06% mixed residual balance*
Classification: Deflagrating pyrotechnic composition.
Use: Potential military composition for disrupting thermal imaging systems.

7. Firework Compositions

Chemicals NOT used in this section but capable of being used in Fireworks (binders are not included) NOTE: The chemicals listed below can be used to make fireworks, but are relatively unseen by most pyrotechnics enthusiasts, and manufacturers. It should be noted, that most of the following chemicals are classified as primary explosives, but most can self-deflagrate, which means, they burn on their own power, and do not require oxidizing agents or reducing agents.
NOTE: The following listings are taken from The Preparatory Manual of Explosives, by Jared Ledgard.

1. Ammonium Chlorate		**2. Ammonium Picramate.**
		
AC forms colorless crystals or a white powder. AC is very soluble in water, and as a result, this decreases the popularity for its use. The salt can detonate by percussion or shock, but is relatively stable. In can be used in making initiation compositions when mixed with heavy metal chromates, perchlorates, or dichromates for use in blasting caps or detonators. AC can also be used in making priming mixtures with primary explosives for use in bullets ect,. AC is primarily used in fireworks, and a variety of pyrotechnic compositions. It is also heavily used in high performance rocket propellants alone, or mixed with its perchlorate with aluminum or other powdered metals. AC is a strong oxidizer, and mixtures with combustible materials ignite rapidly and violently.		Ammonium picramate forms highly flammable crystals, which ignite easily and burn violently. The crystals are easily detonated by heat, sparks, shock, flame, and percussion. Ammonium picramate like similar compounds are used extensively in priming mixtures for bullets and the like, initiation (ignition) charges for blasting caps and detonators, fireworks and other pyrotechnic compositions, and in high performance gun propellants and rocket propellants. Ammonium picramate should be stored submerged in kerosene.
Method of Preparation 1: Dissolve 300 grams of sodium chlorate into 720 milliliters of water. Then add 174 grams of 28 – 30% ammonia solution, or 450 grams of 10% ammonia solution, or pass 48 grams of anhydrous ammonia into the chlorate solution while stirring the chlorate solution. Thereafter, place this mixture into an ice bath, and chill to 0 Celsius. Then, pass 1000 grams of dry carbon dioxide into the reaction mixture at a steady rate while stirring the reaction mixture and maintaining its temperature at 0 Celsius, or add in small pieces, 900 grams of dry ice. After the carbon dioxide addition, continue to stir the reaction mixture for 30 minutes at 0 Celsius, and then filter-off the precipitated sodium bicarbonate. Thereafter, recrystallize the ammonium chlorate from the reaction mixture. Note: Do not over recrystallize the ammonium chlorate from the reaction mixture; this means only remove about 80% of the water during the recrystallization process. If a rotary evaporator is available, place the filtered reaction mixture there into, and remove the water under high vacuum. If boiling the mixture at 100 Celsius during the recrystallization process causes some decomposition of the ammonium chlorate, place the filtered reaction mixture into a shallow pan, and heat the pan at 50 Celsius while blowing air over the surface of the liquid. Do this until dry solid remains (a small portable cooling fan can		**Method of Preparation 1:** Into a flask, place 400 grams of picric acid, and then add about 100 grams of water. Then stir the mixture to form a paste. Thereafter, rapidly add 230 grams of 13% ammonia solution while stirring the paste. After the addition of the 13% ammonia solution, stir the mixture for 20 minutes, and then place the flask into an ice bath and cool to 0 Celsius. When the mixture reaches 0 Celsius, slowly add 2948 grams of a 9% ammonium bisulfide solution over a period of 4 hours while keeping the reaction mixture at 0 Celsius and stirring. After the addition of the 9% ammonium bisulfide solution, filter-off the blood red semi-solid mass, and then wash (several times with the same washing portion) with six 50-milliliter portions of carbon disulfide (to remove the sulfur and other impurities). After the washing, vacuum dry or air-dry the product. Note: The carbon disulfide can be recycled by distillation.

be used). After the recrystallization process, vacuum dry or air-dry the crystals, and the store them in an amber glass bottle in a cool dry place.	
3. Sodium picramate	**4. NTA**
	
Sodium picramate forms stable crystals, which ignite rapidly and burn violently. The crystals are used in priming compositions for bullets and the like, initiation compositions for blasting caps and detonators, high performance rocket propellants, fireworks and a variety of pyrotechnics compositions for flares, incendiaries, and signals. It is also used as an intermediate in the production of other high explosives. Sodium picramate should be stored submerged in kerosene.	NTA forms hygroscopic crystals or powder, which are soluble in water, acetone, isopropyl alcohol, and ether. It is used in blasting caps and detonators when mixed with RDX, making demolition charges when admixed with nitrocellulose or nitro starch, and in priming mixtures with lead styphnate, lead azide, or diazodinitrophenol. NTA is acidic and readily forms salts with strong alkalies—all the salts of NTA are explosive, and are primary explosives. The salts of NTA can easily be prepared by precipitation of the corresponding salt with a base such hydroxide or carbonate.
Method of Preparation 1: Into a flask, place 400 grams of picric acid, and then add about 100 grams of water to form a paste. Then prepare a solution by dissolving 70 grams of sodium hydroxide into 400 milliliters of water. After adding the sodium hydroxide to the water, allow the solution to cool to room temperature, and then rapidly add this sodium hydroxide solution to the picric acid paste while vigorously stirring the paste. After the addition of the sodium hydroxide solution, continue stirring the mixture for 20 minutes. Afterwards, place the reaction mixture into an ice bath, and cool to 0 Celsius. After which, slowly add 2948 grams of 9% ammonium bisulfide solution over a period of 4 hours while keeping the reaction mixture at 0 Celsius and stirring. After the addition of the 9% ammonium bisulfide solution, filter-off the product, and then wash the product (several times with the same washing portion) with six 50-milliliter portions of carbon disulfide (to remove the sulfur and other impurities). After washing the product with carbon disulfide, vacuum dry or air-dry the product. Note: The carbon disulfide can be recovered by distillation.	**Method of Preparation 1:** **Step 1: Preparation of guanazine hydrobromide** Into a 3-neck flask equipped with a thermometer and motorized stirrer, place 600 milliliters of water, and then chill to about 5 Celsius in an ice bath. Afterwards, slowly add 242 grams of 99% anhydrous hydrazine while stirring the water. Then, carefully add 400 grams of cyanogen bromide over a period of 2 hours while stirring the reaction mixture, and maintain its temperature below 35 Celsius. After the addition, stir the reaction mixture for about 30 minutes, and then rapidly add another 400 grams of cyanogen bromide over a period of 30 minutes while rapidly stirring the reaction mixture and maintaining its temperature below 35 Celsius. After the addition, stir the reaction mixture for 4 hours, and then stop stirring, and allow the reaction mixture to stand for 24 hours. Then, add 400 milliliters of isopropyl alcohol, and then stir the reaction mixture for about 20 or 30 minutes. Thereafter, filter-off the precipitated product, wash with 400 milliliters of isopropyl alcohol, and then carefully vacuum dry, or air-dry the product. The result will be about 400 grams of guanazine hydrobromide with a decomposition point of 257 Celsius. Step 2: Preparation of NTA Into a 3-neck flask equipped with a motorized stirrer, thermometer, and gas outlet tube, place 450 grams of sodium nitrite, and then 600 milliliters of water. Then, rapidly stir the mixture while heating to 90 Celsius. This mixture will be designated solution A. Now, while solution A is being heated, prepare a second mixture, designated solution B, by placing 60 grams of guanazine hydrobromide into a beaker, and then add 150 milliliters of water. During the mixing, stir rapidly. After adding the water, add with stirring, 27 grams baking soda. Right after which, warm the solution to 30 or 40 Celsius until no more gas evolution takes place. While solution B is

	reacting, add 152 grams of copper nitrate trihydrate to solution A with rapid stirring. During the addition of the copper nitrate, keep solution A around 90 Celsius. Thereafter, add solution B, drop wise, to solution A while rapidly stirring solution A and maintaining its temperature around 90 Celsius. After the addition, continue to stir the reaction mixture for 90 minutes with stirring. After which, remove the heat source and allow the reaction mixture to cool to room temperature. Then filter-off the precipitated product, and then vacuum dry or air-dry. Next, take the dry filtered-off product, and place into a suitable beaker containing 300 milliliters of 70% nitric acid, and then allow this acid mixture to stand for about 2 hours. After 2 hours, extract the acid mixture with ten 500-milliliter portions of diethyl ether. After the extraction, combine all ether fractions, if not already done so, and then evaporate-off the ether using a rotary evaporator, or carefully distill-off the ether until dry solid remains. When dry solid remains, remove the solid form the flask, and then recrystallize from 1000 milliliters of isopropyl alcohol, and then vacuum dry or air-dry the product.
5. NTO	**6. TADA**
	
NTO is a white crystalline compound, which is moderately soluble in water giving a yellow solution. It is relatively acidic, and forms stable salts with many metals—most of these salts are capable of deflagrating, and the heavy metal salts are primary explosives, which easily detonate. The potassium, sodium, and lithium salts of NTO are prepared by condensing NTO with a strong base such as the hydroxide or carbonate. The ammonium and diamine salts have also been prepared from the corresponding ammonia and amino compounds. NTO is highly resistant to shock, friction, and percussion and is more stable overall then RDX. NTO is somewhat expensive to manufacture, but the cost is outweighed by its remarkable performance as a high explosive. It can be alloyed with many secondary explosives for use in a wide variety of explosives charges. It can also be used in high performance gun propellants with nitroglycerine or nitrocellulose, and in rocket propellants with nitromethane and hydrazine, or ammonium perchlorate and a powdered metal. Salts of NTO are prepared by treating NTO with a powdered metal carbonate in ether, followed by addition of 95% ethanol.	TADA is an interesting high explosive with excellent properties and resistance to shock, friction, and percussion. It is one of only a few compounds that demonstrate excellent explosives properties without actually having any nitro groups. Even though TADA has excellent explosives properties, it is primarily used soley in the manufacturer of rocket propellants when admixed with ammonium perchlorate, HMX, or nitrocellulose and a reducing agent. However, TADA can be used in the preparation of explosive charges when mixed with nitroglycerine, or other liquid explosives. Because of cheaper methods of preparation (as in the following procedure), its popularity is increasing. TADA can also be used in pyrotechnic compositions for use in flares, fireworks, and incendiaries.
Method of Preparation 1: Step 1: Preparation of TO Place 460 milliliters of 85% formic acid and 446 grams of semicarbazide hydrochloride into a flask, and then heat the mixture to 50 Celsius while stirring until all of the	Method of Preparation 1: 1. Prepare a hydrogen cyanide solution by dissolving 28 grams of 99% hydrogen cyanide into 220 grams water, and then cool the solution to 0 Celsius. 2. Prepare a second solution by dissolving 74 grams of sodium azide into 200 grams of water, and then cool this solution to 0 Celsius. Now, slowly add drop wise, the hydrogen cyanide solution to the sodium azide solution over a period of 20

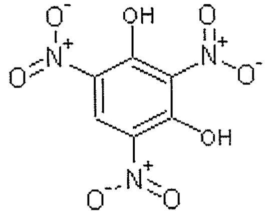
semicarbazide hydrochloride has dissolved. After the semicarbazide has dissolved, distill the mixture at 100 Celsius to remove excess formic acid, and continue the distillation until precipitation of a solid begins. When precipitation begins, rapidly add 600 milliliters of water to the flask, and continue the distillation at 100 Celsius until the solid contents in the flask are near dryness. After which, remove the heat source, and allow the mixture to cool to room temperature.

Step 2: Preparation of NTO

Slowly add 1000 milliliters of 70% nitric acid to the cooled flask containing the TO mixture (prepared in step 1). After the addition of the 70% nitric acid, heat the resulting mixture with strong stirring to 55 Celsius for 40 minutes. The reaction is exothermic (heat produced) and brown fumes evolve (be careful that the reaction temperature does not go above 55 Celsius. If the temperature begins to climb over 55 Celsius, remove the heat source until the reaction mixtures temperature reduces). After 40 minutes, remove the heat source, and then cool the reaction mixture to 5 Celsius using an ice bath. Then keep at 5 Celsius for 1 hour, and then filter-off the precipitated product. Then wash the precipitated product with 200 milliliters of ice water, and then dry the NTO in an oven at 70 Celsius for approximately 24 hours.

minutes while keeping the temperature of the sodium azide solution at 0 Celsius and stirring. Next, add 1 grams of copper-II-sulfate pentahydrate while stirring the reaction mixture. Afterwards, prepare another solution by mixing 54 grams of 35 – 36% hydrogen peroxide, 4 grams of water, and 6 grams of 88% formic acid, and then cool this solution to 0 Celsius. Then slowly add, drop wise, this solution to the reaction mixture over a period of 90 minutes while keeping the temperature of the reaction mixture at 0 Celsius and stirring. After the addition of the hydrogen peroxide/water/formic acid solution, remove the ice bath and then stir the reaction mixture at room temperature for one hour. After one hour, heat the reaction mixture to 30 Celsius while stirring. Right when the temperature of the reaction mixture hits 30 Celsius, increase the heat to 40 Celsius, and heat at this temperature for 2 hours with stirring. After 2 hours, raise the temperature to 90 Celsius, and then heat the reaction mixture at this temperature for 6 hours with stirring. After 6 hours, add 62 grams of ammonium chloride, and then reduce the heat to 50 Celsius. Then stir the reaction mixture at 50 Celsius for 2 hours. Thereafter, remove the heat source, and then cool the reaction mixture to 10 Celsius by means of an ice water bath while continuously stirring the reaction mixture. Keep at the reaction mixture at 10 Celsius while stirring for 1 hour. After 1 hour, filter-off the precipitated crystal product, and then wash the crystals with 100 milliliters of cold water. Then vacuum dry or air-dry the product.

7. Styphnic Acid



Styphnic acid is a yellow crystalline solid with a melting point of 176 Celsius. It is insoluble in water, but soluble in alcohol, ether, and acetic acid. Styphnic acid turns deep yellow on contact with air, so it should be stored in tightly sealed bottles in a cool place. The compound is corrosive and readily forms salts with metal hydroxides and carbonates—many of which are primary explosives, i.e., lead styphnate. Styphnic acid burns rapidly and violently when ignited. For safety reasons, styphnic acid should be stored wet with 10% water. It is used primarily in the manufacture of lead styphnate, but is used with outstanding results in explosives compositions when mixed with nitrocellulose, sodium nitrate, or ammonium perchlorate and adding inert fillers such as sodium sulfate, wax, paraffins, glue, oils, or gum Arabic. It is also widely used in initiating compositions along with lead styphnate, or in combination with lead azide or diazodinitrophenol. Styphnic acid also demonstrates potential use in fireworks and other pyrotechnic compositions.

Method of Preparation 1: Place 220 grams of resorcinol, 840 milliliters of 16% nitric acid, and 1900 grams of crushed ice into a suitable flask fitted with a stirrer. When the resorcinol has been dissolved, prepare a new solution by dissolving 300 grams of sodium nitrite into 1830 milliliters of water, and then add this sodium nitrite solution to the resorcinol/nitric acid solution slowly, over a period of 60 minutes with vigorous stirring. After the addition, place 800 milliliters of 60% nitric acid into a suitable flask and heat to 60 Celsius. After which, slowly transfer (portion wise) the resorcinol/nitric acid mixture into the hot 60% nitric acid over a period of 4 hours while maintaining the temperature of the 60% nitric acid at 60 Celsius and stirring. After the addition, raise the temperature of the mixture to 82 Celsius, and then heat at 82 Celsius for 30 minutes. After which, slowly raise the temperature to 97 Celsius while stirring, and heat for 90 minutes at 97 Celsius. Afterwards, remove the heat source and allow the mixture to cool to room temperature. After which, filter-off the precipitated styphnic acid, wash with 2000 milliliters of cold water, and then vacuum dry or air-dry the product.

Method of Preparation 2:

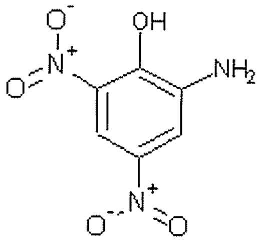
Step 1: Preparation of Dinitroresorcinol monohydrate

To 16 liters of water add and dissolve 440 grams of resorcinol, and then 452 grams of 98% sulfuric acid. Immediately thereafter, add 6800 grams of crushed ice to mixture, and then stir the mixture vigorously until the internal temperature of the mixture reaches about 0 Celsius. Then prepare a solution by dissolving 600 grams of sodium nitrite into 3200 milliliters of water, and then add this sodium nitrite solution to the sulfuric/resorcinol mixture over a period of 6 minutes while vigorously stirring the mixture and maintaining its temperature below 5 Celsius. After the addition of the sodium nitrite solution, continue to stir and cool the reaction mixture below 5 Celsius for 30 minutes. Note: A precipitate will begin to form. After the 30 minute period, filter-off the precipitated dinitroresorcinol monohydrate, and wash with several hundred milliliters of cold water (use gravity filtration).

Step 2: Preparation of Styphnic acid

Place 3000 milliliters of 40% nitric acid into a beaker, and then gently heat this mixture to about 30 Celsius. Thereafter, carefully mix the moist filter cake, prepared at the end of step 1 to the nitric acid solution over a period of about 30 minutes, while stirring the nitric acid and keeping its temperature around 30 Celsius. Immediately after the first addition of the filter cake, nitrogen oxide gases will be evolved, followed by the formation of a foam (the foam will dissipate after about 10 minutes). After the addition, raise the temperature of the mixture to 95 Celsius, and then hold this temperature for 1 hour. After heating for 1 hour, remove the heat source and allow the reaction mixture to cool to room temperature. Note: A precipitate will form. When the reaction mixture reaches room temperature, filter-off the precipitated product, wash with 300 milliliters of 2% nitric acid, and then with 600 milliliters of cold water. Then vacuum dry or air-dry the product. The result will be pale yellow crystals, well suitable for use in preparing lead styphnate, or styphnic acid compositions.

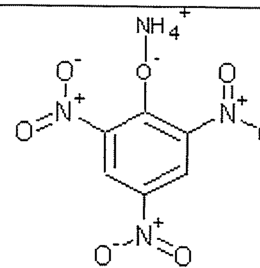
8. Picramic Acid



Picramic acid forms dark red needles, with a melting point of 170 Celsius. It is insoluble in water, but soluble in glacial acetic acid and benzene. A small sample of picramic acid explodes in contact with a flame producing a brilliant flash, and larger samples ignite rapidly and burn violently. Its chief uses are in the manufacture of picramates for use in primary explosive compositions for blasting caps and detonators and pyrotechnic compositions, and in the preparation of compositions for flares, incendiary compositions, fireworks, and many other pyrotechnic compositions. It also has significant use in rocket propellants, and high performance gunpowders. Picramic acid can be used in explosives charges when mixed with nitrocellulose, TNT, or other secondary explosives for use in demolition charges.

Method of Preparation 1: Dissolve 100 grams of ammonium

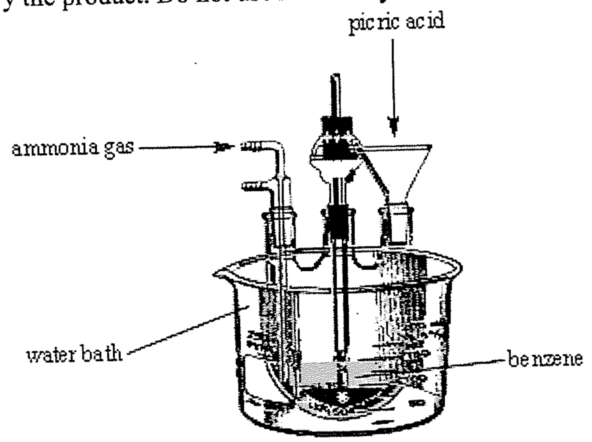
9. Ammonium Picrate



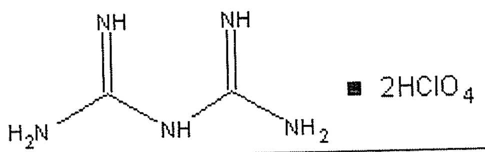
Ammonium picrate forms bright yellow scales, or orthorhombic crystals, which are insoluble in water. The crystals explode easily from heat, shock, friction, fire, and percussion. Ammonium picrate is commonly used in priming compositions for bullets and the like, initiation compositions for blasting caps and detonators, high performance rocket propellants, and fireworks and other pyrotechnic compositions. Ammonium picrate should be stored submerged in kerosene.

Method of Preparation 1: Bubble 3 grams of ammonia gas picramate in 1000 milliliters of cold water while stirring the water (if some of the ammonium picramate fails to dissolve, add an additional 400 milliliters of water). To this solution, add drop wise, over a period of ten minutes, 26.8 grams of glacial acetic acid. After the addition of the glacial acetic acid, filter-off the product, wash with 400 milliliters of cold water, and then dry in an oven at 80 Celsius for 1 hour. Note: Salts of picramic acid are made by neutralizing picramic acid with metal hydroxides or carbonates. Most salts of picramic acid are primary explosives.

into 400 milliliters of benzene. Then, stir the mixture while slowly adding and dissolving 38 grams of finely divided (powdered) picric acid. Keep the reaction mixture at room temperature (a cold water bath may or may not be needed). While slowly adding the picric acid, bubble another 3 grams ammonia gas into the reaction mixture. After the addition of the ammonia gas and the picric acid, stir the solution for 2 hours at room temperature. The ammonium picrate will begin to separate shortly after the first couple of additions of the picric acid. After 2 hours, filter-off the ammonium picrate, wash with 500 milliliters of water, and then vacuum dry or air-dry the product. Do not use heat to dry the ammonium picrate.



10. Biguanide diperchlorate



Biguanide diperchlorate forms white crystals with a melting point of 218 Celsius. The crystals are thermally stable, and can be alloyed with many other secondary explosives for use a variety of applications including explosives charges, warheads, and other munitions. Biguanide diperchlorate is an effective propellant either by itself, or when admixed with nitrocellulose, nitro starch, HMX, or nitroglycerine for use in high performance gun propellants, and rocket propellants. It is also very useful as a substitute for PETN in blasting cords and PETN compositions—BDC is more stable then PETN. Biguanide diperchlorate is impact insensitive, and is commonly used with ammonium nitrate and ethylenediamine dinitrate for use in melt cast compositions along with TATB for demolition charges, missile warheads, and mortar bombs.

Method of Preparation 1: Dissolve 60 grams of biguanide into 1000 milliliters of 95% ethanol, and then cool this mixture to 5 Celsius by means of an ice bath. (Note: shortly after, some of the biguanide will recrystallize out; never mind this). Now dissolve 170 grams of 70% perchloric acid into 200 milliliters of 95% ethanol (take caution, add the perchloric acid to the ethanol slowly). Afterwards, slowly add this perchloric acid/ethanol solution to the biguanide mixture over a period of about 6 hours while keeping the reaction temperature around 5 Celsius. Note: After about 1/3 of the perchloric acid mixture has been added, the crystallized

biguanide, formed earlier, will re-dissolve. After the addition of the perchloric acid mixture, add 1000 milliliters of ethyl acetate, and then place the mixture into a rotary evaporator; apply sufficient vacuum to evaporate the reaction mixture to "near" dryness: remove about 90% of the total volume. After which, add 500 milliliters of ethyl acetate, and then evaporate the reaction mixture using the same rotary evaporator to near dryness: remove about 90% of the total volume. After which, repeat the process once more using one last portion of ethyl acetate, 500 milliliters, and evaporating to near dryness: remove about 90% of the total volume. Now, remove the contents from the rotary evaporator, and filter-off any precipitated product. Then wash the product with 500 milliliters of ethyl acetate, and then vacuum dry or air dry the product. The result will be 160 grams of the product as a white solid. Note: If a rotary evaporator is not available, simply use a standard distillation apparatus to remove the ethyl acetate, and ethanol.

The following table outlines the chemicals listed in the previous table, and their use in possible firework compositions.

TABLE AA (Active chemicals verse oxidizers): The result of the actual mixture can vary widely:

	1. Potassium Nitrate	**2. Barium Nitrate**	**3. Strontium Nitrate**	**4. Ammonium Perchlorate**	**5. Potassium Perchlorate**
1. Ammonium Chlorate	0	0	0	0	0
2. Ammonium Picramate	1 part to 1 part (may explode when ignited)	1 part to 2 parts (may explode when ignited)	1 part to 3 parts (Low order of activity)	1 part to 3 parts (Low order of activity)	1 part to 4 parts (Possibly no activity upon ignition)
3. Sodium picramate	1 part to 1 part (may explode when ignited)	2 parts to 1 part (may explode when ignited)	3 parts to 1 part (Low order of activity)	4 parts to 1 part (Low order of activity)	5 parts to 1 part (Low order of activity)
4. NTA	Any combination	Any combination	Any combination	Any combination	1 part to 2 parts
5. NTO	1 part to 2 parts (may explode when ignited)	1 part to 3 parts (Stable)	1 part to 3 parts (Stable)	1 part to 1 part (may explode when ignited)	Any combination
6. Styphnic Acid	0	Any combination	Any combination	Any combination	1 part to 1 part (forms dangerous shock sensitive mixture)
7. TADA	0	0	0	0	0
8. Picramic Acid	1 part to 1 part (may explode when ignited)	1 part to 2 parts (may explode when ignited)	1 part to 3 parts (Low order of activity)	Any combination	0
9. Ammonium Picrate	Any combination	2 parts to 2 parts	2 parts to 3 parts	½ part to 4 parts	0
10. Biguanide diperchlorate	0	0	Any combination	0	Any combination

TABLE BB (Active chemicals verse reducing agents): The result of the actual mixture can vary widely:

	1. Powdered Aluminum	**2. Powdered Sulfur**	**3. Charcoal**	**4. Antimony Sulfide**	**5. Iron powder**	**6. Magnesium Powder**	**7. Teflon or other Polymer**
1. Ammonium Chlorate (dangerous)	0 (forms dangerous mixture).	0 recommended, but try 1 part to 5 parts (forms	3 parts to 1	0	4 parts to 2	Any combination	3 parts to 1 (forms smooth burning mixture)

		dangerous mixture).					
2. Ammonium Picramate	1 part to 1	2 parts to 1	2 parts to 2	1 part to 1	2 parts to 2	2 parts to 2	4 parts to 1
3. Sodium picramate	Any combination	Any combination	Any combination	Any combination	Any combination	Any combination	Any combination
4. NTA	0	0	0	1 part to 4	5 parts to 2	5 parts to 3	5 parts to 1
5. NTO	1 part tol	1 part to 1	1 part to 1	4 parts to 1	4 parts to 1	4 parts to 1	5 parts to 1
6. Styphnic Acid	0 (forms dangerous shock sensitive compounds on prolonged storage)	1 part to 1	2 parts to 1	5 parts to 1	0 (forms dangerous shock sensitive compounds on prolonged storage)	0 (forms dangerous shock sensitive compounds on prolonged storage)	0
7. TADA	2 parts to 1	1 part to 1	1 part to 1	0 (forms dangerous mixture)	1 part to 1	1 part to 1	4 parts to 1 (3 parts to 1 when using Teflon)
8. Picramic Acid	0	4 parts to 1	4 parts to 1	2 parts to 3	0	0	4 parts to 1
9. Ammonium Picrate	1 part to 1	2 parts to 1	2 parts to 2	1 part to 1	2 parts to 2	2 parts to 2	4 parts to 1
10. Biguanide diperchlorate	Any combination	Any combination	Any combination	Any combination	Any combination	Any combination	Any combination

TABLE CC: Workable firework compositions (not all tested): The result of the actual mixture can vary widely:

	Example mixture A	Example mixture B
1. Ammonium Chlorate (dangerous)	1 part ammonium chlorate 1 part antimony trisulfide 3 parts charcoal (very dangerous mixture)	1 part ammonium chlorate 1 part antimony trisulfide 3 parts charcoal 2 parts dextrose (stabilized mixture)
2. Ammonium Picramate	1 part ammonium picramate 2 parts silicon dioxide 1 part charcoal 2 parts Barium nitrate	3 parts Ammonium picramate 1 parts sodium hypophosphite 1 part Teflon 2 parts copper-II-chloride anhydrous
3. Sodium picramate	3 parts Sodium picramate 2 parts lead dioxide 1 part nitrocellulose 2 parts sodium sulfide anhydrous 1 part red phosphorus	3 parts Sodium picramate 2 parts fours of sulfur 1 part strontium nitrate 2 parts powdered sugar 1 part potassium ferrocyanide (Purcussion sensitive)
4. NTA	1 part NTA 1 part nitrocellulose 2 parts copper-II-nitrate anhydrous 1 part charcoal 1.5 parts lead-VI-chromate	4 parts NTA 1 part Boron powder 2 parts potassium chlorate 2 parts red phosphorus
5. NTO	3 parts NTO 1 parts flours of sulfur 2 parts sugar 1 part potassium perchlorate	3 parts NTO 4 parts potassium perchlorate 2 parts Iron powder 2 parts zinc phosphide
6. Styphnic Acid	1 part styphnic acid .5 parts powdered glass 1 part lead-VI-chromate 1 part red phosphorus (Priming composition)	2 parts styphnic acid 1 parts powdered glass 1 part antimony trisulfide 2 parts powdered sulfur .5 parts lead-VI-chromate (Priming composition)
7. TADA	3 parts TADA 1 part charcoal 2 parts potassium nitrate .5 parts lead-VI-chromate 1 part Teflon	4 parts TADA 1 part ammonium perchlorate .1 part copper acetoarsenate 1 part aluminum .5 part binder (H.P. Rocket Propellant)
8. Picramic Acid	4 grams Picramic acid 1 part sodium chloride 2 parts sulfur 1 part barium nitrate	3 parts Picramic acid 1 part red phosphorus 2 parts copper-I-chloride 1 part potassium perchlorate 1.5 parts combustible binder
9. Ammonium Picrate	5 parts Ammonium picrate 1 part aluminum 1 part sulfur 2 parts Teflon (For rocket propulsion)	3 parts ammonium picrate 1part granulated sand 1 part lead-VI-chromate 1 part potassium chlorate 1.5 parts aluminum (Primng composition)
10. Biguanide diperchlorate	4 parts BD 1.5 grams of charcoal .5 grams of sulfur (Gun powder)	4 parts BD 2 parts red phosphorus 1 part sugar (Smoke mixture)

Section 1: Solid Rocket Propellant Compositions

- Solid Rocket Propellant Compositions in this section -

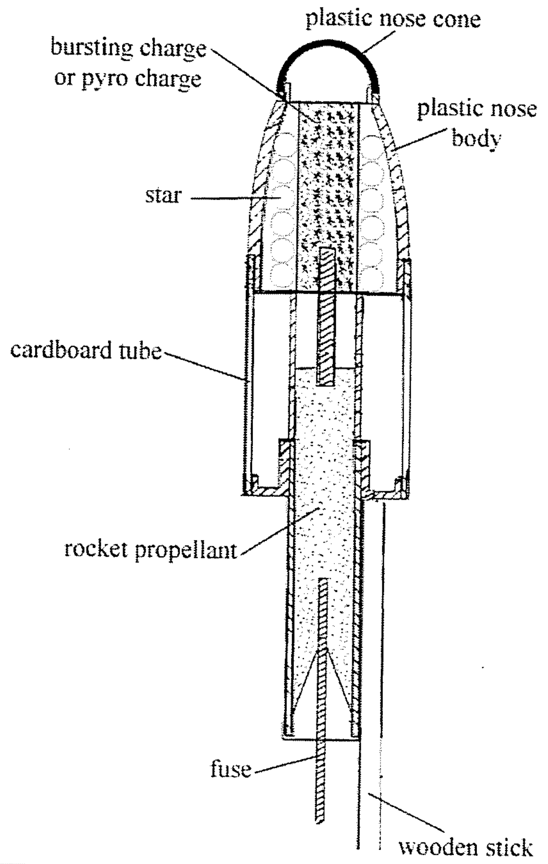
1. 07-01-001A: Moderate velocity "Loud whistling" propellant: *64% potassium perchlorate, 32% potassium benzoate, 3% petroleum jelly, 1% ferric oxide catalyst*	**2. 07-01-002A: Moderate velocity rocket propellant:** *54.5% potassium perchlorate, 36.3% potassium benzoate, 9% biphenyl, 0.20% residue*
3. 07-01-002B: Moderate velocity rocket propellant (modified): *54.5% potassium perchlorate, 36.3% potassium benzoate, 9% naphthalene, 0.20% residue*	**4. 07-01-002C: Moderate velocity rocket propellant (modified 2):** *44.5% potassium perchlorate, 39.6% potassium benzoate, 14.8% potassium nitrate, 0.99% diphenyl methane, 0.11% impurities*
5. 07-01-002D: Moderate velocity rocket propellant (modified 3): *47.1% potassium perchlorate, 28.3% potassium benzoate, 18.8% potassium nitrate, 4.7% naphthalene, 0.94% silica, 0.16% impurities*	**6. 07-01-003A: Phenol-formaldehyde based moderate performance rocket propellant for firework rockets:** *66.5% potassium nitrate, 33.2% phenol-formaldehyde resin, 0.16% phosphoric acid catalyst, 0.14% mixed impurities*
7. 07-01-003B: Phenol-formaldehyde based high performance rocket propellant for firework rockets: *66.5% potassium perchlorate, 33.2% phenol-formaldehyde resin, 0.14% mixed impurities, 0.11% moisture, 0.05% hydrogen chloride*	**8. 07-01-003C: Phenol-formaldehyde based moderate performance rocket propellant for load-carrying rockets:** *48.6% potassium nitrate, 27.7% phenol-formaldehyde resin, 20.8% ammonium picrate, 1.8% moisture, 0.97 hydrogen chloride, 0.13% mix residue*
9. 07-01-004A: General propellant for generating a brilliant blue strobe effect: *63% ammonium perchlorate, 22% GE silicone II, 10% copper-II-oxide, 5% PVC*	**10. 07-01-004B: General propellant for generating a brilliant blue strobe effect:** *63% ammonium perchlorate, 22% Epon 815 epoxy resin, 10% copper-II-oxide, 5% PVC*
11. 07-01-005A: General-purpose propellant: *85% ammonium nitrate, 15% elastomer binder*	**12. 07-01-006A: General-purpose epoxy based propellant:** *79.2% ammonium perchlorate, 19.8% epon 815 epoxy resin, 0.99% copper chromite burn rate catalyst, 0.01% residual balance*
13. 07-01-007A: General-purpose "black powder" based propellant: *72% potassium nitrate, 24% charcoal, 4% sulfur*	**14. 07-01-007B: General-purpose "black powder" based propellant utilizing sodium nitrate instead of potassium nitrate:** *69% sodium nitrate, 27% charcoal, 4% sulfur*
15. 07-01-008A: Low velocity sugar based propellant: *63% potassium nitrate, 27% table sugar, 10% sulfur*	**16. 07-01-008B: Low velocity sugar based propellant with increased water resistance:** *62.84% potassium nitrate, 26.93% table sugar, 9.97% sulfur, 0.26% graphite*
17. 07-01-010A: Low velocity propellant with highly colored smoke trail (GPY-R59): *42% dye, 22% potassium chlorate, 15% sucrose, 14% kaolin clay, 7% ammonium sulfamate*	**18. 07-01-011A: Moderate performance "rubber-like" propellant utilizing polysulfide binder:** *64% ammonium perchlorate, 25.7% polysulfide binder, 8% furfuryl alcohol plasticizer, 1.9% lead dioxide vulcanizing agent, 0.4% stearic acid catalyst*
19. 07-01-012A: Moderate performance propellant: *64.5% potassium nitrate, 11.2% wood charcoal, 11.2% sulfur, 9.8% asphaltum, 3.2% antimony, 0.10% combined balance*	

07-01-001A: Moderate velocity "Loud whistling" propellant:
Into a standard ball mill or similar mixing device, place ***128 grams of finely divided potassium benzoate***, followed by ***4 grams of finely divided ferric oxide***. Thereafter add in 50 grams of Teflon coated steel shot, and then blend the mixture for about 2 hours at 180 RPM. After which, place 60 milliliters of benzene, toluene, xylene, or lacquer thinner into a suitable glass container, and then add in ***12 grams of petroleum jelly*** and stir the mixture to dissolve the petroleum jelly. After the jelly has dissolved, gently warm your beaker or container to about 40 Celsius with moderate stirring. After this, add in the potassium benzoate/ferric oxide mixture, and rapidly blend the mixture thoroughly for about 30 minutes at 40 Celsius. Now, slowly and carefully add in ***256 grams of finely divided potassium perchlorate*** while gently stirring, but thoroughly stirring the mixture at 40 Celsius. After all the potassium perchlorate has been added, maintaining the mixtures temperature at 40 Celsius and thoroughly but gently blend the entire mixture for about 15 to 30 minutes. Afterwards, pour the propellant mixture onto a shallow pan, and allow it to completely air-dry. When the odor of solvent no longer exists, may take several days, pulverize the propellant into relatively fine grain consistency (doesn't have to be perfectly ground or equal grain sizes), and then press the propellant into your desired rocket motors or molds under high pressure. Note: experienced personnel can pour the propellant mixture (after the 15 to 30 minute blending operation and after addition of the potassium perchlorate), directly into your rocket motor or mold. After pouring the propellant, gently but thoroughly shake the rocket motor (to remove air-bubbles), and then allow the motor to cure for at least 1 week at room temperature.
Burn rate: Moderate (below the performance of ammonium perchlorate/aluminum based fuels).
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***64% potassium perchlorate, 32% potassium benzoate, 3% petroleum jelly, 1% ferric oxide catalyst***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used in homemade rockets for hobbyists and/or enthusiasts, and especially in fireworks.

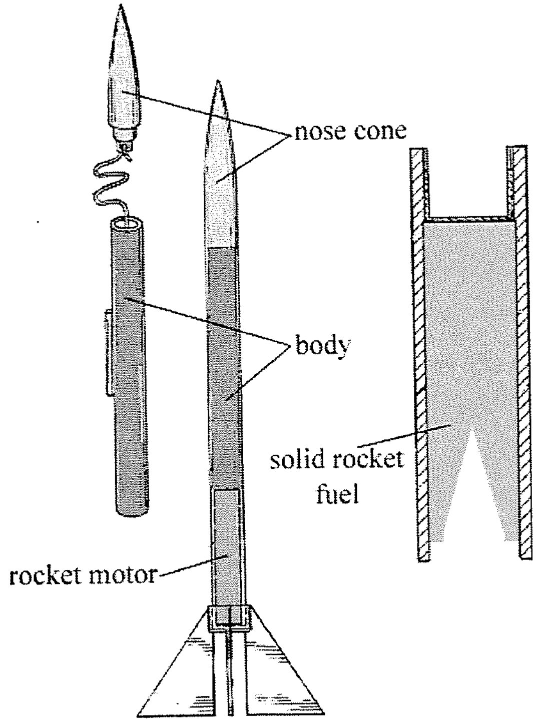
Note: Normally this operation is safe, but preparers should exercise caution as excessive heat or friction may cause ignition of the mixture—first time preparers should perform this operation in a well-ventilated area away from flammable material. Always wear gloves and safety goggles.

High Altitude Aerial Sky Rocket



07-01-002A: Moderate velocity rocket propellant:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***200 grams of potassium benzoate***, followed by ***50 grams of biphenyl***, followed by 200 milliliters of diethyl ether, followed by ***300 grams of potassium perchlorate***, and then blend the entire mixture at moderate speed until the bulk of the ether evaporates leaving behind a pasty mass. Thereafter, in the usual fashion, place the pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with the usual amount of Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 50 RPM for about 30 minutes to form a uniform powder. Once a uniform powder has been formed, it is ready for use. To use, it simply needs to be pressed into any desirable rocket or mold under a pressure of about 500 to 1500 psi.
Burn rate: Moderate (below the performance of ammonium perchlorate/aluminum based fuels).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***54.5% potassium perchlorate, 36.3% potassium benzoate, 9% biphenyl, 0.20% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in fireworks, and homemade rockets for hobbyists and/or enthusiasts.

Model rocket design



07-01-002B: Moderate velocity rocket propellant (modified):
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***200 grams of potassium benzoate***, followed by ***50 grams of naphthalene***, followed by 200 milliliters of hexane, followed by ***300 grams of potassium perchlorate***, and then blend the entire mixture at moderate speed until the bulk of the solvent evaporates leaving behind a pasty mass. Thereafter, in the usual fashion, place the pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with the usual amount of Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 50 RPM for about 30 minutes to form a uniform powder. Once a uniform powder has been formed, it is ready for use. To use, it simply needs to be pressed into any desirable rocket or mold under a pressure of about 500 to 1500 psi.
Burn rate: Moderate (below the performance of ammonium perchlorate/aluminum based fuels).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***54.5% potassium perchlorate, 36.3% potassium benzoate, 9% naphthalene, 0.20% residue***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in fireworks, and homemade rockets for hobbyists and/or enthusiasts.

07-01-002C: Moderate velocity rocket propellant (modified 2):
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***200 grams of potassium benzoate***, followed by ***5 grams of diphenly methane***, followed by ***75 grams of potassium nitrate***, followed by 250 milliliters of acetone, followed by ***225 grams of potassium perchlorate***, and then blend the entire mixture at moderate speed until the bulk of the solvent evaporates leaving behind a pasty mass. Thereafter, in the usual fashion, place the pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with the usual amount of Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 50 RPM for about 30 minutes to form a uniform powder. Once a uniform powder has been formed, it is ready for use. To use, it simply needs to be pressed into any desirable rocket or mold under a pressure of about 500 to 1500 psi.
Burn rate: Moderate (below the performance of ammonium perchlorate/aluminum based fuels).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9

Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***44.5% potassium perchlorate, 39.6% potassium benzoate, 14.8% potassium nitrate, 0.99% diphenyl methane, 0.11% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in fireworks, and homemade rockets for hobbyists and/or enthusiasts.

07-01-002D: Moderate velocity rocket propellant (modified 3):
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***150 grams of potassium benzoate***, followed by ***25 grams of naphthalene***, followed by ***100 grams of potassium nitrate***, followed by 300 milliliters of ethyl acetate, followed by ***250 grams of potassium perchlorate***, and then followed by ***5 grams of finely ground silica***, and then blend the entire mixture at moderate speed until the bulk of the solvent evaporates leaving behind a pasty mass. Thereafter, in the usual fashion, place the pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with the usual amount of Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 50 RPM for about 30 minutes to form a uniform powder. Once a uniform powder has been formed, it is ready for use. To use, it simply needs to be pressed into any desirable rocket or mold under a pressure of about 500 to 1500 psi.
Burn rate: Moderate (below the performance of ammonium perchlorate/aluminum based fuels).
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***47.1% potassium perchlorate, 28.3% potassium benzoate, 18.8% potassium nitrate, 4.7% naphthalene, 0.94% silica, 0.16% impurities***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in fireworks, and homemade rockets for hobbyists and/or enthusiasts.

07-01-003A: Phenol-formaldehyde based moderate performance rocket propellant for firework rockets:
Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place ***200 grams of potassium nitrate***, followed by ***100 grams of a phenol-formaldehyde resin*** (commercially available as Catalin 674/2B, of Catalin, & Co.), and then followed by ***500 milligrams of anhydrous phosphoric acid***, and then gently blend the mixture for about 15 to 20 minutes to form a uniform mix. Thereafter, press the mixture into any desirable rocket motor, engine, tube, ect., and then cure the rocket(s) in an oven at 80 Celsius for about 3 to 4 minutes. Can be ignited using any standard means.
Burn rate: Below ammonium perchlorate propellants.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.5% potassium nitrate, 33.2% phenol-formaldehyde resin, 0.16% phosphoric acid catalyst, 0.14% mixed impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making bottles rockets, and other rockets for fireworks.

07-01-003B: Phenol-formaldehyde based high performance rocket propellant for firework rockets:
As with many procedures in this book, this procedure is identical to the above procedure, but the nitrate is replaced by perchlorate, which increases the overall thrust potential. Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place ***200 grams of potassium perchlorate***, followed by ***100 grams of a phenol-formaldehyde resin*** (commercially available as Catalin 674/2B, of Catalin, & Co.), and then followed by ***500 milligrams (1 drop) of concentrated hydrochloric acid***, and then gently blend the mixture for about 15 to 20 minutes to form a uniform mix. Thereafter, press the mixture into any desirable rocket motor, engine, tube, ect., and then cure the rocket(s) in an oven at 80 Celsius for about 3 to 4 minutes. Can be ignited using any standard means.
Burn rate: 0.25 to 0.31 inches per second at 500 psi
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.

Percentage: ***66.5% potassium perchlorate, 33.2% phenol-formaldehyde resin, 0.14% mixed impurities, 0.11% moisture, 0.05% hydrogen chloride***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making bottles rockets, and other rockets for fireworks.

07-01-003C: Phenol-formaldehyde based moderate performance rocket propellant for load-carrying rockets:

Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place ***175*** ***grams of potassium nitrate***, followed by ***100 grams of a phenol-formaldehyde resin*** (commercially available as Catalin 674/2B, of Catalin, & Co.), and then followed by ***75 grams of ammonium picrate,*** and then followed by ***10 grams of concentrated hydrochloric acid***, and then gently blend the mixture for about 15 to 20 minutes to form a uniform mix. Thereafter, press the mixture into any desirable rocket motor, engine, tube, ect., and then cure the rocket(s) in an oven at 80 Celsius for about 3 to 4 minutes. Can be ignited using any standard means.
Burn rate: Average
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48.6% potassium nitrate, 27.7% phenol-formaldehyde resin, 20.8% ammonium picrate, 1.8% moisture, 0.97 hydrogen chloride, 0.13% mix residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making bottles rockets, and other rockets for fireworks.

07-01-004A: General propellant for generating a brilliant blue strobe effect:

Into a vertical ball mill, filled with Teflon coated steel shot of the usual manner, place ***25 grams of finely divided PVC***, followed by ***110 grams of a binder called GE Silicone II***, and then rotate the vertical drum on high speed for about 30 minutes. Thereafter, add in ***315 grams of ammonium perchlorate***, and then followed by ***50 grams of copper-II-oxide***, and then continue to rotate the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure into molds first, and then allow the mixture to cure at room temperature for a coupe of days. Obviously the molds should have similar dimensions as your rocket.
Burn rate: Based on pressure, usually ranges from 0.05 to 1 at 1000 psi
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): unknown.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63% ammonium perchlorate, 22% GE silicone II, 10% copper-II-oxide, 5% PVC***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making bottles rockets, and other rockets for fireworks.

07-01-004B: General propellant for generating a brilliant blue strobe effect:

This procedure is identical to 07-01-004B except the silicone II is replaced by Epon 815. Into a vertical ball mill, filled with Teflon coated steel shot of the usual manner, place ***25 grams of finely divided PVC***, followed by ***110 grams of a Epon 815 standard epoxy resin***, and then rotate the vertical drum on high speed for about 30 minutes. Thereafter, add in ***315 grams of ammonium perchlorate***, and then followed by ***50 grams of copper-II-oxide***, and then continue to rotate the mixture on high speed for about 1 hour. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure into molds first, and then allow the mixture to cure at room temperature for a coupe of days. Obviously the molds should have similar dimensions as your rocket.
Burn rate: Based on pressure, usually ranges from 0.05 to 1 at 1000 psi
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): unknown.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63% ammonium perchlorate, 22% Epon 815 epoxy resin, 10% copper-II-oxide, 5% PVC***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making bottles rockets, and other rockets for fireworks.

07-01-005A: General-purpose propellant:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***1700 grams of ammonium nitrate***, and then add in ***300 grams of any elastomer liquid binder***, and then blend the mixture in the absence of air for about 15 minutes. Thereafter, press the mixture into any desired rocket motor, engine, ect., in the usual manner, and then cure the motors in an oven at moderate temperature until dry and hard.
Burn rate: 0.04 at 300 psi
Water resistance: Moderate—may absorb moisture slowly on prolonged storage.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): Typical
Tendency to cake: None.
Explosive ability: Can only be detonated under influence from high explosives.
Percentage: ***85% ammonium nitrate, 15% elastomer binder***
Classification: Deflagrating explosive (classified as propellant).
Use: Used for making rockets for multiple uses.

07-01-006A: General-purpose epoxy based propellant:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***1600 grams of ammonium perchlorate***, and then add in ***400 gram of epoxy binder Epon 815***, and then blend the mixture in the absence of air for about 15 minutes. Thereafter, add in ***20 grams of copper-II-chromite*** and then continue to blend the mixture in the absence of air for another 15 minutes. Thereafter, press the mixture into any desired rocket motor, engine, ect., in the usual manner, and then cure the motors in an oven at moderate temperature until dry and hard.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): Typical.
Tendency to cake: None.
Explosive ability: Can only be detonated under influence from high explosives.
Percentage: ***79.2% ammonium perchlorate, 19.8% epon 815 epoxy resin, 0.99% copper chromite burn rate catalyst, 0.01% residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Used for making rockets for multiple uses.

07-01-007A: General-purpose "black powder" based propellant:

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***1440 grams of potassium nitrate***, followed by ***480 grams of charcoal pieces*** (ranging from 1 to 5 millimeters in diameter), and then followed by ***80 grams of powdered sulfur***. Thereafter, add in about 150 milliliters of acetone, and then tumble the mixture at 500 RPM for about 3 hours. Thereafter, remove the mixture from the ball mill, and separate it from the steel shot using a screen in the usual manner, and then place this mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 300 milliliters of acetone, and then blend the mixture for 50 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desired rocket motor, engine, ect., in the usual manner, and then cure the motors in an oven at moderate temperature until dry and hard.
Burn rate: Typical for black powder propellants.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***72% potassium nitrate, 24% charcoal, 4% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: Used for making rockets for multiple uses.

07-01-007B: General-purpose "black powder" based propellant utilizing sodium nitrate instead of potassium nitrate:

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***1380 grams of absolutely dry sodium nitrate***, followed by ***540 grams of charcoal pieces*** (ranging from 1 to 5 millimeters in diameter), and then followed by ***80 grams of powdered sulfur***. Thereafter, add in about 150 milliliters of acetone, and then tumble the mixture at 500 RPM for about 3 hours. Thereafter, remove the mixture from the ball mill, and separate it from the steel shot using a screen in the usual manner, and then place this mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 300 milliliters of acetone,

and then blend the mixture for 50 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desired rocket motor, engine, ect., in the usual manner, and then cure the motors in an oven at moderate temperature until dry and hard.
Burn rate: Typical for black powder propellants.
Water resistance: Moderate—may tend to absorb moisture upon prolonged standing.
Stability: Can be stored for many years.
Flammability (1 to 10): 8+
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***69% sodium nitrate, 27% charcoal, 4% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: Used for making rockets for multiple uses.

07-01-008A: Low velocity sugar based propellant:
Set-up an oil bath, and fill the bath with olive oil, corn oil, or any other suitable oil. Thereafter, place into a stainless beaker or suitable container (must be heat resistant and chemical resistant), ***40 grams of sulfur*** (of 98% purity or better). Now, gently heat the oil until its temperature reaches about 110 Celsius. When the oil is heated to the desired temperature, add in your stainless steel or suitable container containing the sulfur, and allow the sulfur to melt. Thereafter, slowly add in, ***108 grams of regular table sugar***, and rapidly stir the molten sulfur mixture during the entire addition of the sugar. Note: some caramelization may result due to decomposition of the sugar. If this happens don't worry, but the degree of caramelization should be low, meaning once you have added the sugar, if the mixture takes on a brownish color, then your heat is to high. After the sugar has been added, continue to heat and rapidly stir the syrupy sulfur/sugar mixture, while slowly adding in ***252 grams of finely divided potassium nitrate***. Note: normally this operation is not of great hazard, but beginners should start out using smaller quantities before attempting to produce large amounts, as a way of building experience, i.e., divide all quantities of ingredients given by 4. After adding in your potassium nitrate, continue to heat and stir the syrupy mass for about 10 to 15 minutes. After which, your syrupy propellant is ready to use. To use, you must have a rocket motor already set-up as the propellant has to be poured into your motor hot and syrupy, not cooled. After pouring in the molten propellant to your rocket motor, allow your rocket motor to cure for several days in a nice warm place.
Burn rate: Moderate (no where near the performance of ammonium perchlorate/aluminum based fuels).
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***63% potassium nitrate, 27% table sugar, 10% sulfur***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used in homemade rockets for hobbyists and/or enthusiasts, and in fireworks.

Note: Normally this operation is safe, but preparers should exercise caution as excessive heat or friction may cause ignition of the mixture—first time preparers should perform this operation in a well-ventilated area away from flammable material. Always wear gloves and safety goggles

07-01-008B: Low velocity sugar based propellant with increased water resistance:
Set-up an oil bath, and fill the bath with olive oil, corn oil, or any other suitable oil. Thereafter, place into a stainless beaker or suitable container (must be heat resistant and chemical resistant), ***40 grams of sulfur*** (of 98% purity or better). Now, gently heat the oil until its temperature reaches about 110 Celsius. When the oil is heated to the desired temperature, add in your stainless steel or suitable container containing the sulfur, and allow the sulfur to melt. Thereafter, slowly add in, ***108 grams of regular table sugar***, and rapidly stir the molten sulfur mixture during the entire addition of the sugar. Note: some caramelization may result due to decomposition of the sugar. If this happens don't worry, but the degree of caramelization should be low, meaning once you have added the sugar, if the mixture takes on a brownish color, then your heat is to high. After the sugar has been added, continue to heat and rapidly stir the syrupy sulfur/sugar mixture, while slowly adding in ***252 grams of finely divided potassium nitrate***. Note: normally this operation is not of great hazard, but beginners should start out using smaller quantities before attempting to produce large amounts, as a way of building experience, i.e., divide all quantities of ingredients given by 4. After adding in your potassium nitrate, add in ***1 gram of graphite powder***, and then continue to heat and stir the syrupy mass for about 10 to 15 minutes. After which, your syrupy propellant is ready to use. To use, you must have a rocket motor already set-up as the propellant has to be poured into your motor hot and syrupy, not cooled. After pouring in the molten propellant to your rocket motor, allow your rocket motor to cure for several days in a nice warm place.
Burn rate: Moderate (no where near the performance of ammonium perchlorate/aluminum based fuels).
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 7
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***62.84% potassium nitrate, 26.93% table sugar, 9.97% sulfur, 0.26% graphite***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used in homemade rockets for hobbyists and/or enthusiasts, and in fireworks.

Note: Normally this operation is safe, but preparers should exercise caution as excessive heat or friction may cause ignition of the mixture—first time preparers should perform this operation in a well-ventilated area away from flammable material. Always wear gloves and safety goggles.

07-01-010A: Low velocity propellant with highly colored smoke trail (GPY-R59):
Into a standard mixing bowl or blender, equipped with motorized stirrer utilizing a plastic blade, place ***350 grams of ammonium sulfamate***, followed by ***2100 grams of dye*** (for red color smoke, use "solvent red 3", i.e., para-ethoxy-phenyl-azo-napthol; for green smoke, use "solvent green 3", i.e., 1,4,-paratoluidino anthraquinone; and for yellow smoke, use "solvent yellow 33", i.e., 2-(2-quinolyl)-1,3-indandione), followed by ***750 grams of sucrose***, followed by ***1100 grams of potassium chlorate***, followed by ***700 grams of kaolin clay***, and finally followed by 1750 milliliters of acetone, and blend the mixture on moderate speed until 95% of the acetone evaporates. Note: As the acetone evaporates, the mixing speed of the stirrer may have to be increased. As the acetone evaporates, the mixture will take on a dough-like consistency. The object of the mixing is to continue blending while the acetone evaporates in order to form granules. This sort of mixing and solvent evaporation is one of the major ways of forming granules. Once about 95% of the acetone has been evaporated, stop the blending operation, and then place the dough-like granules onto a shallow tray and cure the granules in an oven at 60 Celsius for about 24 to 32 hours. After the curing time, the granules are ready for pressing. To do so, they should be pressed into your desired rocket motor or mold under a dead press pressure of about 5000 psi. Your rocket motor should contain a central empty core by way of a bronze mandrel at time of pressing.
Burn rate: Very slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***42% dye, 22% potassium chlorate, 15% sucrose, 14% kaolin clay, 7% ammonium sulfamate***
Classification: Deflagrating explosive (classified as propellant).
Use: May be used to propel grenades.

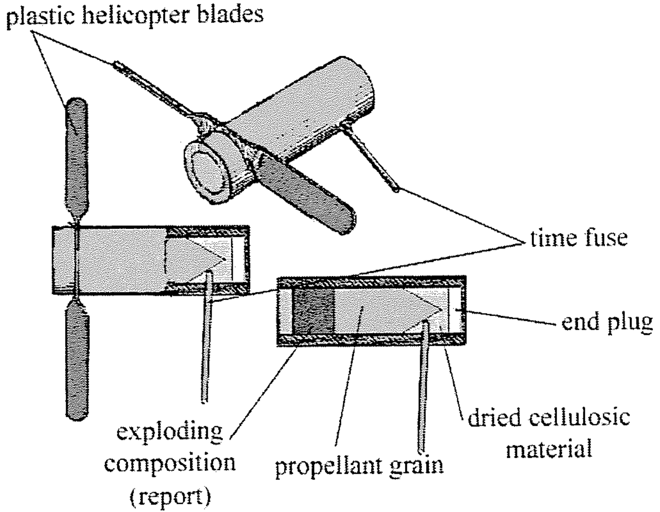
07-01-011A: Moderate performance "rubber-like" propellant utilizing polysulfide binder:
Into a standard mixing bowl, equipped with motorized stirrer utilizing a plastic stir blade, place ***128.5 grams of a polysulfide binder compound*** sold as Thiokol LP-2, followed by ***9.5 grams of lead dioxide***, followed by ***2 grams of stearic acid***, and then blend the mixture on high speed for about 5 minutes. After 5 minutes, add in ***320 grams of ammonium perchlorate***, followed by ***40 grams of furfuryl alcohol***, and then continue to blend the mixture on high speed for about 5 to 10 minutes to form a uniform mix. After blending, the fluidized mixture is then ready for use. To use, it should be poured and vibrated directly into your rocket motor, and then cured at room temperature for about 2 days.
Burn rate: Average at 1000 psi
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Can be detonated but only under severe conditions—requires significant TNT, RDX, or HMX booster.
Percentage: ***64% ammonium perchlorate, 25.7% polysulfide binder, 8% furfuryl alcohol plasticizer, 1.9% lead dioxide vulcanizing agent, 0.4% stearic acid catalyst***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used to propel a wide variety of low velocity missiles especially of the wire-guided type.

07-01-012A: Moderate performance propellant:
Into a large beaker or similar container, equipped with motorized stirrer, place 500 milliliters of naphtha, and then add in ***1209.5 grams of potassium nitrate***, followed by ***211.6 grams of finely powdered wood charcoal***, followed by ***181.4 grams of asphaltum***, followed by ***60.4 grams of finely divided antimony***, followed by ***211.6 grams of sulfur***, and then blend the mixture on moderate speed for about 1 hour at room temperature. After blending for about 1 hour, allow the entire mixture to settle and stand at room

temperature for 2 days. Thereafter, filter-off the insoluble mass, and then place it onto a shallow tray or pan, and allow it to partially air-dry until only a slightly damp mass remains. Thereafter, press this slightly damp mass into any desirable rocket motor, engine, tube, ect., under high pressure, and then allow the munition to cure for several days.

Burn rate: 0.10 to 0.15 at 500 and 1000 psi
Water resistance: Very good
Stability: Can be stored for many years.
Flammability (1 to 10): 8+ (based on pressure exponent).
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***64.5% potassium nitrate, 11.2% wood charcoal, 11.2% sulfur, 9.8% asphaltum, 3.2% antimony, 0.10% combined balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in cheap and economical rockets for commercial and/or military use.

Helicopter device


plastic helicopter blades
time fuse
end plug
dried cellulosic material
exploding composition (report)
propellant grain

Section 2: Firework Star Compositions

- Firework Star Compositions in this section -

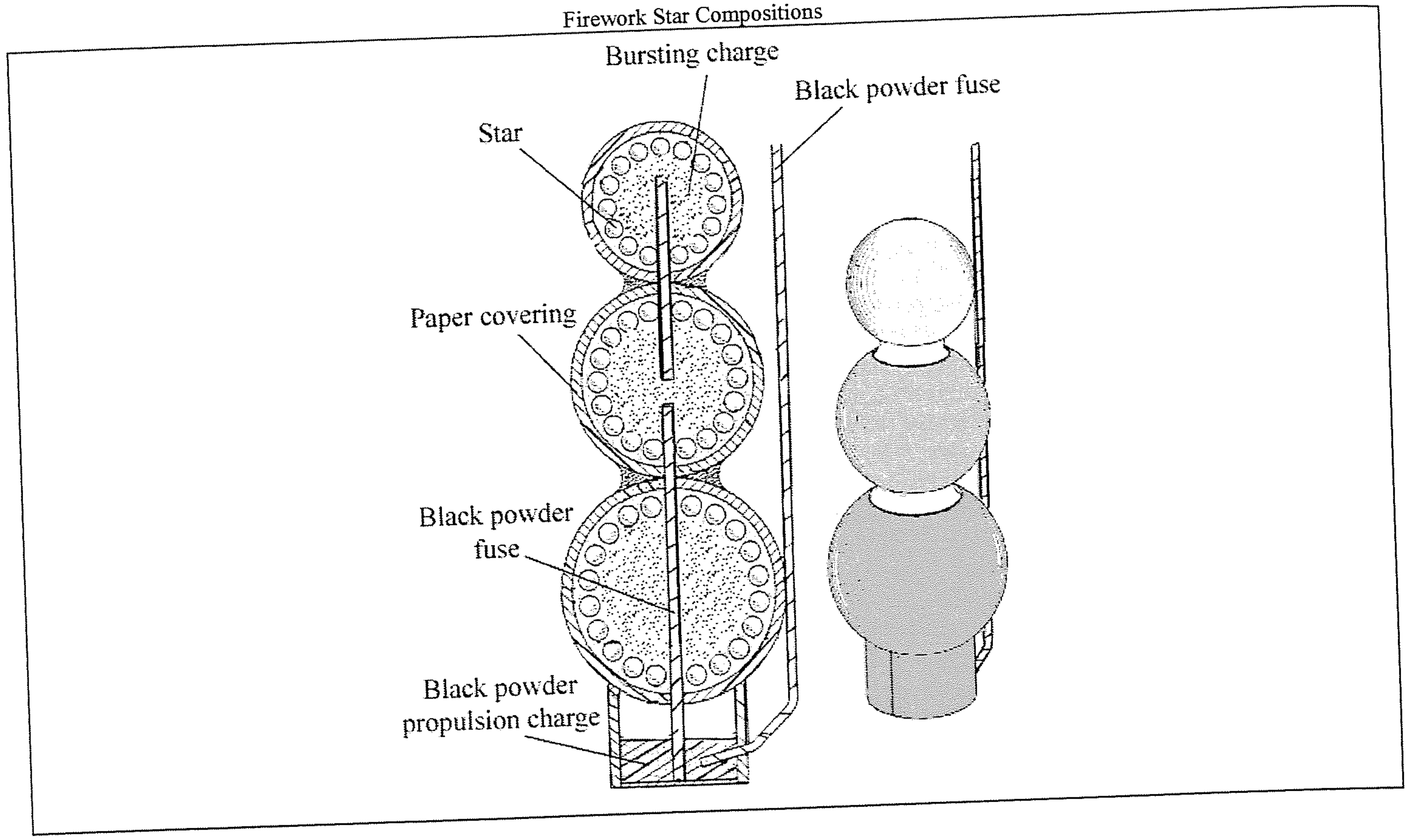
1. **07-02-001A: Melamine-formaldehyde based pyrotechnic composition for red effects stars:** *40% potassium nitrate, 40% phenol-formaldehyde resin, 10% strontium nitrate, 10% aluminum powder*
2. **07-02-002A: Red Star pyrotechnic composition for use in colored stars:** *60% strontium nitrate, 20% potassium chlorate, 20% shellac*
3. **07-02-002B: Red Star pyrotechnic composition for use in colored stars (modified—reduced color glare):** *65% potassium chlorate, 20% shellac, 15% strontium carbonate*
4. **07-02-003A: Red Star pyrotechnic composition for use in colored stars:** *25.15% strontium nitrate, 22.64% potassium nitrate, 22.64% grain meal powder, 18.86% sulfur, 7.54% charcoal, 3.14% antimony sulfide, 0.03% balance*
5. **07-02-004A: Red Star pyrotechnic composition for use in colored stars:** *42.71% potassium perchlorate, 30.09% strontium nitrate, 14.56% red gum, 7.76% PVC, 4.85% shellac, 0.03% residue*
6. **07-02-005A: Pyrotechnic red star mixture for aerial devices:** *32.71% potassium perchlorate, 28.03% ammonium perchlorate, 16.82% strontium carbonate, 14.95% red gum, 3.73% dextrin, 1.86% wood charcoal, 1.86% hexamine, 0.04% difference*
7. **07-02-006A: Pyrotechnic red star mixture for aerial fireworks:** *55% strontium nitrate, 28% magnesium, 17% PVC*
8. **07-02-007A: Brilliant red star composition for aerial fireworks:** *30% magnesium, 30% potassium perchlorate, 20% strontium nitrate, 18% PVC, 1.999% lampblack, 0.001% linseed coating*
9. **07-02-008A: Red star composition for aerial fireworks:** *42.35% ammonium perchlorate, 34.4% magnesium, 9.81% strontium carbonate, 8.78% red gum, 4.64% rice starch, 0.02% impurities*
10. **07-02-009A: Green star composition for aerial fireworks:** *47.2% potassium perchlorate, 28.3% barium nitrate, 14.2% red gum, 5.6% rice starch, 4.7% PVC*
11. **07-02-010A: Green to yellowish green star composition for aerial fireworks:** *43.75% potassium chlorate, 43.75% barium nitrate, 12.5% shellac*
12. **07-02-011A: Green star composition for aerial fireworks:** *50% barium nitrate, 32% magnesium grain, 18% PVC*
13. **07-02-011B: Green star composition for aerial fireworks (with reduced ash):** *43.07% barium nitrate, 24.61% magnesium grain, 19.23% ammonium perchlorate, 13.07% PVC, 0.02% residue*
14. **07-02-012A: Green star composition for aerial fireworks (with increased burn):** *52.41% barium nitrate, 16.12% PVC, 12.09% ammonium perchlorate, 8.06% aluminum powder, 5.64% sulfur, 2.41% red gum, 1.61% dextrin, 2.41% boric acid, 0.05% residue*
15. **07-02-013A: Green star composition for aerial fireworks (19th century Swedish formula):** *34.48% barium nitrate, 27.58% meal powder, 24.13% potassium nitrate, 6.89% wood charcoal, 6.89% sulfur, 0.03% balance*
16. **07-02-013B: Green star composition for aerial fireworks:** *48.48% potassium chlorate, 36.36% barium nitrate, 12.12% shellac, 3.03% dextrin, 0.01% impurities*
17. **07-02-014A: Green star composition for aerial fireworks:** *41.79% potassium perchlorate, 23.88% barium nitrate, 14.92% Parlon compound, 7.46% aluminum, 5.97% red gum, 4.47% dextrin, 1.49% wood charcoal, 0.02% impurities*
18. **07-02-014B: Green star composition for aerial fireworks (aluminum free):** *40.33% potassium perchlorate, 26.89% barium nitrate, 11.76% red gum, 10.08% parlon compound, 5.04% dextrin, 4.2% sulfur, 1.68% wood charcoal, 0.02% balance*
19. **07-02-015A: Green star composition for aerial fireworks (containing barium chlorate):** *43% barium chlorate, 22% potassium perchlorate, 22% red gum, 9% barium nitrate, 4% dextrin*
20. **07-02-016A: Brilliant green star composition for aerial fireworks (with increased light luminosity):** *41% ammonium perchlorate, 33.3% magnesium, 9.5% barium carbonate, 9.5% red gum, 4.8% rice starch filler, 1.9% potassium dichromate*
21. **07-02-016B: Brilliant green star composition with secondary "crackling effect" for aerial fireworks:** *26.51% ammonium perchlorate, 26.22% lead tetraoxide, 21.53% magnesium, 6.14% barium carbonate, 6.14% red gum, 3.23% nitrocellulose, 3.1% soluble rice starch, 2.94% magnalium, 2.94% copper-II-oxide, 1.22% potassium dichromate, 0.03% balance*
22. **07-02-017A: Brilliant blue star composition for aerial fireworks:** *65.97% potassium perchlorate, 13.29% copper-II-oxide, 9.82% red gum, 5.55% rice starch, 5.35% parlon compound, 0.02% impurities*
23. **07-02-017B: Brilliant blue star composition for aerial fireworks:** *56.6% ammonium perchlorate, 18.86% copper-II-oxide, 16.03% sulfur, 5.66% shellac, 2.83% dextrin binder, 0.02% residue*
24. **07-02-018A: Brilliant blue star composition for aerial fireworks:** *59.63% potassium perchlorate, 14.67% copper-I-chloride, 10.09% PVC, 9.17% sulfur, 6.42% red gum, 0.02% balance*
25. **07-02-019A: Brilliant blue star composition for aerial fireworks:** *58.33% ammonium perchlorate, 12.03% copper-II-oxide, 11.11% PVC, 9.25% sulfur, 9.25% dextrin, 0.03%*
26. **07-02-020A: Brilliant blue star composition for aerial fireworks (sensitized with chlorate/sulfur):** *64.28% potassium chlorate, 14.28% sulfur, 14.28% copper-II-acetoarsenite, 7.14%*

rounded balance	*mercury-I-chloride, 0.02% residue*
27. 07-02-020B: Brilliant blue star composition for aerial fireworks (sensitized with chlorate/sulfur): *52.17% potassium chlorate, 26.08% copper-II-sulfate, 17.39% sulfur, 4.34% lead-II-chloride, 0.02% balance*	**28. 07-02-021A: Brilliant blue star composition for aerial fireworks:** *29.19% potassium nitrate, 29.19% meal powder, 21.89% copper-II-ammonium nitrate, 8.75% sulfur, 7.29% wood charcoal, 3.64% rosin, 0.05% balance*
29. 07-02-022A: Brilliant blue star composition for aerial fireworks: *60.8% potassium perchlorate, 13.1% Parlon compound, 12.3% copper-II-carbonate, 9% red gum, 4.8% soluble rice starch filler*	**30. 07-02-023A: Brilliant blue star composition with secondary "crackling effect" for aerial fireworks:** *50.05% potassium perchlorate, 13.31% lead tetraoxide, 10.66% Parlon compound, 9.84% copper-II-carbonate, 7.38% red gum, 4.1% dextrin, 1.64% nitrocellulose, 1.49% magnalium, 1.49% copper-II-oxide, 0.04% impurities*
31. 07-02-024A: Brilliant "robins eggs" blue star composition with bushy flame: *66.66% potassium perchlorate, 14.28% PVC, 9.52% silicone, 9.52% copper-II-oxide, 0.02% residues*	**32. 07-02-025A: Brilliant blue star composition (modified):** *65% potassium chlorate, 12.5% lactose, 12.5% copper-II-oxychloride, 5% Saran compound, 5% dextrin*
33. 07-02-026A: Brilliant blue star composition with salmon colored flame edges: *70% ammonium perchlorate, 20% Fimo compound, 10% malachite mineral*	**34. 07-02-027A: Brilliant purple star composition:** *53.73% potassium chlorate, 17.91% sulfur, 14.92% strontium sulfate, 7.46% copper-II-sulfate, 2.98% lead-II-chloride, 2.98% charcoal, 0.02% impurities*
35. 07-02-028A: Brilliant purple star composition: *50% potassium chlorate, 23.68% strontium carbonate, 18.42% sulfur, 5.26% copper-II-chloride, 2.63% lead-II-chloride, 0.01% residue*	**36. 07-02-028B: Brilliant violet star composition:** *61.3% potassium perchlorate, 12.4% Parlon compound, 9.1% red gum, 7.4% strontium carbonate, 5% basic copper carbonate, 4.8% rice starch*
37. 07-02-029A: Brilliant yellow star composition: *60% potassium chlorate, 20% sodium bicarbonate, 20% dextrin*	**38. 07-02-030A: Brilliant yellow star composition:** *61.53% potassium chlorate, 23.07% sodium oxalate, 15.38% lampblack, 0.02% balance*
39. 07-02-030B: Brilliant yellow star composition for aerial use: *53.33% potassium chlorate, 26.66% sodium oxalate, 13.33% shellac, 6.66% dextrin, 0.02% residue*	**40. 07-02-030C: Brilliant yellow star composition for aerial use:** *41.66% meal powder, 33.33% potassium nitrate, 16.66% sulfur, 6.94% wood charcoal, 1.38% rosin, 0.03% balance (un rounded)*
41. 07-02-030D: Brilliant yellow star composition for aerial use (fortified with magnesium): *45% potassium perchlorate, 30% magnesium powder, 13% ultramarine, 10% PVC, 2% lampblack*	**42. 07-02-031A: Orange star composition for aerial use:** *63.15% strontium nitrate, 14.03% sodium oxalate, 8.77% shellac, 8.77% potassium chlorate, 5.26% sulfur, 0.02% impurities*
43. 07-02-031B: Orange star composition for aerial use: *40.40% potassium perchlorate, 35.35% strontium nitrate, 22.22% FIMO, 2.02% iron-III-oxide, 0.01% balance*	**44. 07-02-032A: Brilliant white star composition for aerial use:** *58% potassium nitrate, 40% aluminum flake, 2% dextrin*
45. 07-02-032B: Brilliant white star composition for aerial use: *40% potassium perchlorate, 32% magnesium, 16% sulfur, 12% wood charcoal*	**46. 07-02-033A: Brilliant white star composition for aerial use:** *53% barium nitrate, 28% magnesium, 12% potassium nitrate, 7% Parlon compound*
47. 07-02-032C: Brilliant white star composition for aerial use: *60% strontium nitrate, 20% magnesium, 20% PVC*	**48. 07-02-033A: Brilliant white star composition for aerial use:** *61% potassium perchlorate, 31% aluminum flake, 8% Lycopodium compound*
49. 07-02-034A: Brilliant white star composition for aerial use: *66.66% potassium nitrate, 22.22% antimony sulfide, 11.11% sulfur, 0.01% mixed balance*	**50. 07-02-034B: Brilliant white star composition for aerial use (fortified with dextrin):** *64.36% potassium nitrate, 18.39% sulfur, 13.79% antimony sulfide, 3.44% dextrin, 0.02% mixed balance*
51. 07-02-035A: Brilliant orange star composition for aerial use: *75% potassium perchlorate, 15% shellac, 10% cryolite synthetic mineral*	**52. 07-02-035B: Brilliant yellow star composition for aerial use (fortified with dextrin):** *70% potassium perchlorate, 10% shellac, 10% cryolite synthetic mineral, 10% PVC*
53. 07-02-036A: Brilliant red star composition for aerial use (fortified with dextrin): *52.88% potassium perchlorate, 14.42% Parlon compound, 14.42% strontium carbonate, 8.65% red gum, 5.76% magnalium alloy, 3.84% dextrin, 0.03% residue*	**54. 07-02-036B: Brilliant orange star composition for aerial use (fortified with dextrin):** *52.88% potassium perchlorate, 14.42% Parlon compound, 14.42% calcium carbonate, 8.65% red gum, 5.76% magnalium alloy, 3.84% dextrin, 0.03% residue*
55. 07-02-036C: Brilliant green star composition for aerial use (fortified with dextrin): *28.84% potassium perchlorate, 23.07% barium nitrate, 14.42% Parlon compound, 14.42% calcium carbonate, 10.57% magnalium 50/50 alloy, 4.8% red gum, 3.84% dextrin, 0.04% balance*	**56. 07-02-036D: Brilliant blue star composition for aerial use (fortified with dextrin):** *52.88% potassium perchlorate, 14.42% Parlon compound, 14.42% calcium carbonate, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 0.03% balance*

57. 07-02-037A: Brilliant yellow star composition for aerial use (Complex mixture A): *39.66% potassium perchlorate, 14.42% Parlon, 12.69% barium nitrate, 8.41% magnalium 50/50 alloy, 7.93% barium carbonate, 6.53% red gum, 6.49% calcium carbonate, 3.84% dextrin, 0.03% balance*	**58. 07-02-037B: Brilliant purple star composition for aerial use (Complex mixture B):** *52.88% potassium perchlorate, 14.42% Parlon, 11.53% copper-II-oxide, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 2.16% strontium carbonate, 0.72% calcium carbonate, 0.04% balance*
59. 07-02-037C: Brilliant "peach colored" star composition for aerial use (Complex mixture C): *52.88% potassium perchlorate, 14.42% Parlon, 8.65% calcium carbonate, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.6% strontium carbonate, 2.16% copper-II-oxide, 3.84% dextrin, 0.04% balance*	**60. 07-02-037D: Brilliant "maroon colored" star composition for aerial use (Complex mixture D):** *52.88% potassium perchlorate, 14.42% Parlon, 12.25% strontium carbonate, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 2.16% copper-II-oxide, 0.04% balance*
61. 07-02-037E: Brilliant "magenta colored" star composition for aerial use (Complex mixture E): *52.88% potassium perchlorate, 14.42% Parlon, 8.65% red gum, 7.21% strontium carbonate, 7.21% copper-II-oxide, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 0.03% balance*	**62. 07-02-037F: Brilliant "Turquoise colored" star composition for aerial use (Complex mixture F):** *39.66% potassium perchlorate, 14.42% Parlon, 12.69% barium nitrate, 8.41% magnalium 50/50 alloy, 7.93% barium carbonate, 6.53% red gum, 6.49% copper-II-oxide, 3.84% dextrin, 0.03% balance*
63. 07-02-037G: Brilliant "aqua colored" star composition for aerial use (Complex mixture G): *33.65% potassium perchlorate, 18.46% barium nitrate 14.42% Parlon, 11.53% barium carbonate, 9.61% magnalium 50/50 alloy, 5.57% red gum, 3.84% dextrin, 2.88% copper-II-oxide, 0.04% balance*	

07-02-001A: Melamine-formaldehyde based pyrotechnic composition for red effects stars:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter and weight, place ***320 grams of potassium nitrate***, followed by followed by ***80 grams of strontium nitrate***, and then followed by ***80 grams of finely divided aluminum powder,*** and then tumble the mixture at about 100 RPM for about 30 minutes. Thereafter place this dried tumbled mixture into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, and then add in ***320 grams of a melamin-formaldehyde resin*** (commercially available), and then blend the mixture on high speed for about 10 to 15 minutes. Thereafter, the mixture can be extruded into cut stars of any desirable shape and size. Note: ball shaped stars of any diameter can be made by rolling the mixture into dough-like balls, or utilizing any known commercially available star extrusion machines, and then quickly prime the stars by rolling or gently shaking, so as to coat, the stars with a suitable priming composition., and then allow the finished products to cure for a day or so at room temperature.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% potassium nitrate, 40% phenol-formaldehyde resin, 10% strontium nitrate, 10% aluminum powder***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making effects stars for use in rockets, mortars, and other aerial display fireworks.

Illustration: 3-shot aerial mortar shell



07-02-002A: Red Star pyrotechnic composition for use in colored stars:
Into a suitable mixing drum, filled with small diameter Teflon coated steel shot, place ***100 grams of finely divided potassium chlorate***, followed by ***300 grams of strontium nitrate***. Thereafter, tumble the mixture on low speed for about 1 hour. Thereafter, into a suitable beaker or similar container, place 100 milliliters of 95% ethyl alcohol, and then add and dissolve ***100 grams of standard commercially available shellac***, and then stir the mixture to dissolve the bulk of the shellac. Thereafter, add in the potassium chlorate/strontium nitrate mixture, and then blend the mixture (preferably with a motorized stirrer), for about 2 hours at room temperature. Thereafter, place the stirred mixture onto a shallow pan, and allow it to thoroughly air-dry. Note: a vacuum apparatus can be used to save solvent and speed up the process. Thereafter, place the dried mass into a clean ball mill, fitted with Teflon coated steel shot of the usual diameter, and then tumble the mixture for about 1 hour to form a uniform mixture. Thereafter, place the pulverized mass into a clean beaker or similar container, and then add in a very small amount of a 50/50 mixture of acetone and water, and then blend the mixture manually to form a paste. Thereafter, the paste can be kneaded or rolled into dough like balls (stars), of any desired diameter. Once the stars have been rolled, they should be cured in an oven at moderate temperature until dry and hard.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Moderate.
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% strontium nitrate, 20% potassium chlorate, 20% shellac***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making effects stars for use in rockets, mortars, and other aerial display fireworks.

07-02-002B: Red Star pyrotechnic composition for use in colored stars (modified—reduced color glare):
Into a suitable mixing drum, filled with small diameter Teflon coated steel shot, place ***325 grams of finely divided potassium chlorate***, followed by ***75 grams of strontium carbonate***. Thereafter, tumble the mixture on low speed for about 1 hour. Thereafter, into a suitable beaker or similar container, place 125 milliliters of 95% ethyl alcohol or 100 milliliters of 99% isopropyl alcohol, and then add and dissolve ***100 grams of standard commercially available shellac***, and then stir the mixture to dissolve the bulk of the shellac. Thereafter, add in the potassium chlorate/strontium carbonate mixture, and then blend the mixture (preferably with a motorized stirrer), for about 60 minutes at room temperature to 30 Celsius. Thereafter, place the stirred mixture onto a shallow pan, and allow it to thoroughly air-dry. Note: a vacuum apparatus can be used to save solvent and speed up the process. Thereafter, place the dried mass into a clean ball mill, fitted with Teflon coated steel shot of the usual diameter, and then tumble the mixture for about 1

hour to form a uniform mixture. Thereafter, place the pulverized mass into a clean beaker or similar container, and then add in a very small amount of a 50/50 mixture of acetone and water, and then blend the mixture manually to form a paste. Thereafter, the paste can be kneaded or rolled into dough like balls (stars), of any desired diameter. Once the stars have been rolled, they should be cured in an oven at moderate temperature until dry and hard.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Below average.
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***65% potassium chlorate, 20% shellac, 15% strontium carbonate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making effects stars for use in rockets, mortars, and other aerial display fireworks.

07-02-003A: Red Star pyrotechnic composition for use in colored stars:
Into a suitable mixing drum, filled with small diameter Teflon coated steel shot, place ***180 grams of potassium nitrate***, followed by ***150 grams of flours of sulfur,*** followed by ***200 grams of strontium nitrate,*** followed by ***25 grams of antimony sulfide,*** followed by ***180 grams of fine grained meal powder***, and then followed by ***60 grams of fine grained wood charcoal***. Thereafter, tumble the mixture on low speed for about 2 hours. Thereafter, place the pulverized mass into a clean beaker or similar container, and then add in a very small amount of acetone, and then blend the mixture manually to form a paste. Thereafter, the paste can be kneaded or rolled into dough like balls (stars), of any desired diameter. Once the stars have been rolled, they should be cured in an oven at moderate temperature until dry and hard.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Below average.
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***25.15% strontium nitrate, 22.64% potassium nitrate, 22.64% grain meal powder, 18.86% sulfur, 7.54% charcoal, 3.14% antimony sulfide, 0.03% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making effects stars for use in rockets, mortars, and other aerial display fireworks.

07-02-004A: Red Star pyrotechnic composition for use in colored stars:
Into a suitable mixing drum, filled with 5 millimeter diameter Teflon coated steel shot (150 to 250 grams), place ***220 grams of potassium perchlorate***, followed by ***155 grams of strontium nitrate,*** and then followed by ***75 grams of red gum***. Thereafter, tumble the mixture on low speed for about 2 hours. Thereafter, into a suitable beaker or similar container, place 120 milliliters of 95% ethyl alcohol, and then heat the alcohol until it begins to boil. Thereafter, add in ***25 grams of shellac***, and then followed by ***40 grams of finely grained PVC polymer compound***. Thereafter, blend the mixture for about 5 minutes and then add in the dry mixture prepared in the beginning, and then blend the entire mass (while the alcohol boils) for about 15 to 20 minutes. Thereafter, remove the heat source, and then spread the mixture out onto a shallow pan, and allow it to thoroughly air-dry. Now, as in previous examples, place the dried mass into a suitable mixing drum and pulverize it to a fine grain powder. Thereafter, add in a small amount of acetone, hexane, or ether, and then blend the mixture manually to form a dough like paste. Thereafter, the paste can be kneaded or rolled into dough like balls (stars), of any desired diameter. Once the stars have been rolled, they should be cured in an oven at moderate temperature until dry and hard.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Below average.
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.71% potassium perchlorate, 30.09% strontium nitrate, 14.56% red gum, 7.76% PVC, 4.85% shellac, 0.03% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making red stars for use in rockets, mortars, and other aerial display fireworks.

07-02-005A: Pyrotechnic red star mixture for aerial devices:

Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place 75 milliliters of ice cold water, followed by ***20 grams of fine grain wood charcoal***, followed by ***160 grams of commercially available red gum***, followed by ***40 grams of standard dextrin,*** and then moderately blend the mixture for about 10 minutes. Thereafter, add in 50 milliliters of warm acetone, immediately followed by ***20 grams of hexamine*** (commercially available), followed by ***180 grams of strontium carbonate,*** followed by ***350 grams of potassium perchlorate,*** and then followed by ***300 grams of ammonium perchlorate,*** and then continue to blend the mixture for about 30 minutes at room temperature. Thereafter, press the mixture into any desirable pellets, disc, rods, or roll the pasty mass into stars, or cut stars of any desirable size and shape, and then cure the pellets, discs, stars, ect., in an oven at 50 to 60 Celsius for dry and hard. Can be ignited using any standard means.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***32.71% potassium perchlorate, 28.03% ammonium perchlorate, 16.82% strontium carbonate, 14.95% red gum, 3.73% dextrin, 1.86% wood charcoal, 1.86% hexamine, 0.04% difference***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-006A: Pyrotechnic red star mixture for aerial fireworks:
Into a suitable mixing bowl or container, equipped with motorized stirrer, place 150 milliliters of acetone followed by ***170 grams of powdered or flaked PVC polymer***, and then blend the mixture for about 15 minutes at room temperature. Thereafter, add in ***280 grams of magnesium powder,*** and then followed by ***550 grams of strontium nitrate,*** and then continue to blend the mixture for about 30 minutes at room temperature. Now, add in 150 milliliters of ice-cold water, and then continue to blend the mixture on moderate speed for about 30 minutes. There, filter-off the insoluble mass, and then press the filtered-off pasty mass into any desirable shape such as a pellet, discs, rods, ect., or dry the filtered-off mass to the point where it forms a pasty dough like mass. Then roll the pasty dough like mass into stars of any desired size. Thereafter, bake the stars in an oven at moderate temperature until they are dry and hard.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55% strontium nitrate, 28% magnesium, 17% PVC***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-007A: Brilliant red star composition for aerial fireworks:
Into any suitable mixing drum (vertical or horizontal ball mill), filled with a small amount of small Teflon coated steel shot, and then add in 20 milliliters of linseed oil, followed by ***300 grams of magnesium*** of 60 to 70 mesh. Thereafter, tumble the mixture on low speed for about 10 minutes. Thereafter, filter-off the coated magnesium grains, and then vacuum dry them. Now, into a clean large mixing bowl or container, equipped with motorized stirrer, place the coated magnesium grains, followed by ***300 grams of potassium perchlorate***, followed by ***200 grams of strontium nitrate***, followed by ***180 grams of fine grained PVC polymer***, followed by ***20 grams of finely divided lampblack***. Thereafter, add in 75 milliliters of 99% isopropyl alcohol, and then blend the mixture until a thick like dough like mass is obtained. Once a dough like mass is obtained, roll the dough into stars of any desirable diameter, and then cure the rolled stars in an oven at moderate temperature until dry and hard. May need to be primed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% magnesium, 30% potassium perchlorate, 20% strontium nitrate, 18% PVC, 1.999% lampblack, 0.001% linseed coating***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-008A: Red star composition for aerial fireworks:
Into a suitable empty mixing drum or similar ball mill, place ***45 grams of glutinous rice starch*** (soluble), followed by ***95 grams of strontium carbonate***, followed by ***85 grams of red gum***, and then followed by ***333 grams of magnesium powder*** of 60 to 70 mesh. Thereafter, tumble the mixture on moderate RPM speed for about 1 hour. Thereafter, place these ingredients into a clean mixing bowl or similar container, equipped with motorized stir blade, followed by 175 milliliters of ether, and then followed ***410 grams of absolutely dry ammonium perchlorate***, and then finally followed by ***19 grams of potassium dichromate***. Thereafter, blend the mixture to form a uniform dough like mass. Then roll the dough like mass into stars of any desirable size and then cure in the usual manner. May need to be primed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 to 7
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Can detonate, but only under extreme conditions.
Percentage: ***41.54% ammonium perchlorate, 33.73% magnesium, 9.62% strontium carbonate, 8.61% red gum, 4.55% rice starch, 1.92% potassium dichromate, 0.03% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-009A: Green star composition for aerial fireworks:
Into a suitable mixing bowl or container, equipped with motorized stirrer, place 150 milliliters of acetone followed by ***56 grams of glutinous rice starch***, thereafter add in ***47 grams of fine grained PVC,*** followed by ***283 grams of barium nitrate,*** followed by ***472 grams of potassium perchlorate,*** and then followed by ***142 grams of red gum,*** and then blend the mixture for about 30 minutes at room temperature. Now, add in 150 milliliters of ice-cold water, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, filter-off the insoluble mass, and then press the filtered-off pasty mass into any desirable shape such as a pellet, discs, rods, ect., or dry the filtered-off mass to the point where it forms a pasty dough like mass. Then roll the pasty dough like mass into stars of any desired size. Thereafter, bake the stars in an oven at moderate temperature until they are dry and hard. May need to be primed.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¼
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47.2% potassium perchlorate, 28.3% barium nitrate, 14.2% red gum, 5.6% rice starch, 4.7% PVC***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-010A: Green to yellowish green star composition for aerial fireworks:
Into a suitable beaker or similar container, place 75 milliliters of 95% ethyl alcohol, and then add and dissolve ***60 grams of shellac***. Thereafter, boil the mixture, and when the alcohol begins to boil, add in ***210 grams of potassium chlorate***, and then followed by ***210 grams of barium nitrate***. Thereafter, blend the mixture for about 5 minutes. Thereafter, allow the mixture to cool to room temperature. Thereafter, add in 65 milliliters of ice-cold water, and then stir the mixture for about 5 minutes. Thereafter, filter-off the insoluble mass, and then place it on a shallow pan and allow it to dry until a thick dough like material is obtained. Once it is, roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***43.75% potassium chlorate, 43.75% barium nitrate, 12.5% shellac***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-011A: Green star composition for aerial fireworks:

Into a suitable beaker or similar container, place 200 milliliters of tetrahydrofuran, and then add and dissolve *180 grams of fine-grained PVC*. Thereafter, add in *320 grams of average commercially available magnesium grains,* and then blend the mixture for about 15 minutes. Thereafter, add in *500 grams of barium nitrate,* and then continue to blend the mixture for about 1 hour. Thereafter, add in 200 milliliters of ice-cold water, and then stir the mixture for about 5 minutes. Thereafter, filter-off the insoluble mass, and then place it on a shallow pan and allow it to dry until a thick dough like material is obtained. Once it is, roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: Below average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 to 7
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% barium nitrate, 32% magnesium grain, 18% PVC***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-011B: Green star composition for aerial fireworks (with reduced ash):

Into a suitable beaker or similar container, place 190 milliliters of tetrahydrofuran, and then add and dissolve *170 grams of fine-grained PVC*. Thereafter, add in *320 grams of average commercially available magnesium grains,* and then blend the mixture for about 15 minutes. Thereafter, add in *560 grams of barium nitrate,* and then followed by *250 grams of ammonium perchlorate,* and then continue to blend the mixture for about 1 hour. Thereafter, add in 190 milliliters of ice-cold water, and then stir the mixture for about 5 minutes. Thereafter, filter-off the insoluble mass, and then place it on a shallow pan and allow it to dry until a thick dough like material is obtained. Once it is, roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.07% barium nitrate, 24.61% magnesium grain, 19.23% ammonium perchlorate, 13.07% PVC, 0.02% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-012A: Green star composition for aerial fireworks (with increased burn):

Into a suitable beaker or similar container, place 190 milliliters of tetrahydrofuran, and then add and dissolve *100 grams of fine-grained PVC*. Thereafter, add in *325 grams of barium nitrate,* and then blend the mixture for about 15 minutes. Thereafter, add in *50 grams of aluminum powder,* followed by *75 grams of ammonium perchlorate,* and then followed by *35 grams of flours of sulfur,* followed by *15 grams of red gum,* and then continue to blend the mixture for about 15 minutes. Thereafter, add in *10 grams of dry boric acid*, and then followed by *10 grams of powdered dextrin*. Immediately thereafter, add in 190 milliliters of ice-cold water, and then stir the mixture for about 5 minutes. Thereafter, filter-off the insoluble mass, and then place it on a shallow pan and allow it to dry until a thick dough like material is obtained. Once it is, roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: N/A
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Unlikely.
Percentage: ***52.41% barium nitrate, 16.12% PVC, 12.09% ammonium perchlorate, 8.06% aluminum powder, 5.64% sulfur, 2.41% red gum, 1.61% dextrin, 2.41% boric acid, 0.05% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-013A: Green star composition for aerial fireworks (19th century Swedish formula):

Into a suitable ball mill, filled with 150 to 200 grams of Teflon coated steel shot of 5 millimeters in diameter, place *100 grams of fine grained soft wood charcoal*, followed by *350 grams of potassium nitrate*, followed by *100 grams of flours of sulfur*, followed by *400 grams of fine grained meal powder*, and then followed by *500 grams of barium nitrate*. Thereafter, tumble the mixture for about 1 hour at 100 to 150 RPM. Thereafter, empty the tumbled contents into a suitable beaker or similar mixing container, and then add in 50 milliliters of 95% alcohol spirits, and then blend the mixture to form a dough like mass. Note: more alcohol may need to be added. Once a dough like mass is obtained, simply roll the dough into stars of any desired diameter, and then cure them in an oven at low temperature until dry and hard. Should be primed using standard compositions.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***34.48% barium nitrate, 27.58% meal powder, 24.13% potassium nitrate, 6.89% wood charcoal, 6.89% sulfur, 0.03% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-013B: Green star composition for aerial fireworks:

Into a suitable beaker or similar container, place 75 milliliters of 95% ethyl alcohol, and then add in *100 grams of shellac*. Thereafter, add in *25 grams powdered dextrin,* followed by *400 grams of potassium chlorate,* and then followed by *300 grams of barium nitrate.* Thereafter, simply blend the mixture for an hour or so to form a thick dough. Then simply roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48.48% potassium chlorate, 36.36% barium nitrate, 12.12% shellac, 3.03% dextrin, 0.01% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-014A: Green star composition for aerial fireworks:

Into a suitable beaker or similar container, place 75 milliliters of 95% ethyl alcohol, followed by 75 milliliters of ice-cold water. Then add in *40 grams of red gum*, followed by *10 grams soft wood charcoal,* followed by *100 grams of "Parlon" compound,* followed by *30 grams of powdered dextrin,* and then followed by ***50 grams of aluminum powder (commercially available as aluminum #809).*** Thereafter, simply blend the mixture for about 30 to 40 minutes to form a dough. Thereafter, add in 50 milliliters of acetone followed by *160 grams of barium nitrate*, and then followed by *280 grams of potassium perchlorate*. Then continue to blend the mixture for about 30 minutes. Now, filter-off any liquid, and then place the filtered-off mass onto a shallow pan or tray and allow it to dry to the point that a thick dough is obtained. Once a nice dough is obtained, simply roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.79% potassium perchlorate, 23.88% barium nitrate, 14.92% Parlon compound, 7.46% aluminum, 5.97% red gum, 4.47% dextrin, 1.49% wood charcoal, 0.02% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-014B: Green star composition for aerial fireworks (aluminum free):

Into a suitable beaker or similar container, place 75 milliliters of 95% ethyl alcohol, followed by 75 milliliters of ice-cold water. Then add in *140 grams of red gum*, followed by *20 grams soft wood charcoal,* followed by *120 grams of "Parlon" compound,* and then followed by ***60 grams of powdered dextrin.*** Thereafter, simply blend the mixture for about 30 to 40 minutes to form a dough. Thereafter, add in 50 milliliters of acetone followed by ***320 grams of barium nitrate***, followed by ***480 grams of potassium perchlorate***, and finally followed by ***50 grams of flours of sulfur***. Then continue to blend the mixture for about 30 minutes. Now, filter-off any liquid, and then place the filtered-off mass onto a shallow pan or tray and allow it to dry to the point that a thick dough is obtained. Once a nice dough is obtained, simply roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.

Burn rate: Similar to 07-03-014A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.33% potassium perchlorate, 26.89% barium nitrate, 11.76% red gum, 10.08% parlon compound, 5.04% dextrin, 4.2% sulfur, 1.68% wood charcoal, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-015A: Green star composition for aerial fireworks (containing barium chlorate):
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 75 milliliters of ice water, followed by 25 milliliters of 95% ethyl alcohol. Then add in ***220 grams of red gum***, followed by ***40 grams of dextrin***. Thereafter, blend the mixture for about 10 minutes. Then, add in ***90 grams of barium nitrate***, followed by ***220 grams of potassium perchlorate***, and then followed by ***430 grams of barium chlorate***. Thereafter, continue to blend the mixture for about 30 minutes. Thereafter the mixture is ready for use. To use, simply roll the mixture into stars of any desirable diameter, and then cure the stars in an oven at moderate temperature. These stars should be primed using any suitable priming mixture.

Burn rate: Low.
Water resistance: below average.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 4 to 5 (depends on hardness of final product).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43% barium chlorate, 22% potassium perchlorate, 22% red gum, 9% barium nitrate, 4% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-016A: Brilliant green star composition for aerial fireworks (with increased light luminosity):
Into a suitable empty ball mill, place ***333 grams of magnesium grains*** of 60 mesh, followed by ***19 grams of potassium dichromate***. Thereafter, tumble the mixture at 100 RPM for about 10 minutes to coat the magnesium. Thereafter, place this mixture into a suitable mixing bowl or similar container, equipped with motorized stirrer, and then add in 100 milliliters of ether. Thereafter, add in ***410 grams of ammonium perchlorate***, followed by ***95 grams of red gum,*** followed by ***48 grams of soluble rice starch***, and then followed by ***95 grams of barium carbonate***. Thereafter, blend the mixture until a good viscous dough like material is obtained. Once it has, the mixture is ready for use. To use, simply roll the mixture into stars of any desirable diameter, and then cure the stars in an oven at moderate temperature. These stars should be primed using any suitable priming mixture.

Burn rate: Good.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 6+ (depends on hardness).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41% ammonium perchlorate, 33.3% magnesium, 9.5% barium carbonate, 9.5% red gum, 4.8% rice starch filler, 1.9% potassium dichromate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-016B: Brilliant green star composition with secondary "crackling effect" for aerial fireworks:
Into a suitable mixing drum, bowl, or any other similar container, equipped with motorized stirrer, place 100 milliliters of acetone, and then add in ***20 grams of high nitrogen content nitrocellulose***, and then blend the mixture for about 5 minutes. Thereafter, add in ***162.2 grams of Lead tetraoxide*** (Pb3O4), followed by ***18.2 grams of a "magnalium"*** alloy compound, and then followed by ***18.2***

grams of copper-II-oxide. Thereafter, blend the mixture until a uniform dough like material is obtained. Thereafter, simply roll the stars into any desired diameter, and then cure the stars at room temperature. Note; these stars ignite easily, so avoid friction, heat, sparks, ect. Now, into a suitable empty ball mill, place ***133.2 grams of magnesium grains*** of 60 mesh, followed by ***7.6 grams of potassium dichromate***. Thereafter, tumble the mixture at 100 RPM for about 10 minutes to coat the magnesium. Thereafter, place this mixture into a suitable mixing bowl or similar container, equipped with motorized stirrer, and then add in 50 milliliters of ether. Thereafter, add in ***164 grams of ammonium perchlorate***, followed by ***38 grams of red gum,*** followed by ***19.2 grams of soluble rice starch***, and then followed by ***38 grams of barium carbonate***. Thereafter, blend the mixture until a good viscous dough like material is obtained. Once it has, the material is ready for rolling. To do so, take the cured stars (obtained in the beginning of the procedure), and then roll the new dough like material on the cured stars to make combined stars of any desired (increased) diameter. Thereafter, these new rolled stars should then be cured at room temperature until dry and hard. The new stars (outer layer) should be primed with a thin layer of any desired priming mix.

Burn rate: Good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾ —inner crackling star 9+
Ease of ignition (1 to 10): 5 ¾ (inner crackling star has 9+)
Tendency to cake: None.
Explosive ability: None—inner crackling star explodes upon ignition.
Percentage: ***26.51% ammonium perchlorate, 26.22% lead tetraoxide, 21.53% magnesium, 6.14% barium carbonate, 6.14% red gum, 3.23% nitrocellulose, 3.1% soluble rice starch, 2.94% magnalium, 2.94% copper-II-oxide, 1.22% potassium dichromate, 0.03% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars (with a secondary crackling effect) for a variety of aerial devices.

07-02-017A: Brilliant blue star composition for aerial fireworks:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, add in 75 milliliters of 95% ethyl alcohol, followed by 35 milliliters of ice water. Thereafter, add in ***134 grams of finely powdered copper-II-oxide***, and then followed by ***54 grams of parlon compound,*** and then blend the mixture for about 10 minutes to form a uniform mixture. Thereafter, add in ***99 grams of red gum***, followed by ***665 grams of potassium perchlorate***, and then followed by ***56 grams of soluble rice starch***. Thereafter, blend the mixture until a good viscous dough like material is obtained. Once it has, the mixture is ready for use. To use, simply roll the mixture into stars of any desirable diameter, and then cure the stars in an oven at moderate temperature. This star may or may not need to be primed.

Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 6 to 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***65.97% potassium perchlorate, 13.29% copper-II-oxide, 9.82% red gum, 5.55% rice starch, 5.35% parlon compound, 0.02% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-017B: Brilliant blue star composition for aerial fireworks:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, add in 100 milliliters of acetone. Thereafter, add in ***60 grams of shellac***, followed by ***30 grams of dextrin,*** and then followed by ***170 grams of powdered sulfur***, and then blend the mixture for about 10 minutes. Thereafter, add in ***200 grams of copper-II-oxide,*** followed by ***600 grams of ammonium perchlorate***, and then blend the mixture for about 10 minutes. Thereafter, add in 100 milliliters of 99% isopropyl alcohol (chilled to 0 Celsius), and then continue to blend the mixture for about 5 minutes. Thereafter, pour-off any liquid, or filter-off the solid mass, and then allow the mass to dry to the point where a dough like material remains. Once it has, the mixture is ready for use. To use, simply roll the mixture into stars of any desirable diameter, and then cure the stars in an oven at moderate temperature. This star may or may not need to be primed.

Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Possible, but only under severe conditions.

Percentage: ***56.6% ammonium perchlorate, 18.86% copper-II-oxide, 16.03% sulfur, 5.66% shellac, 2.83% dextrin binder, 0.02% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.
Note: Numerous modifications exist for this process.

07-02-018A: Brilliant blue star composition for aerial fireworks:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 100 milliliters of tetrahydrofuran, and then add and dissolve ***110 grams of fine grained PVC polymer***. Note: the bulk of the PVC may or may not dissolve, this does not matter. Thereafter, add in ***70 grams of red gum***, followed by ***100 grams of powdered sulfur,*** followed by ***160 grams of copper-I-chloride***, and then followed by ***650 grams of potassium perchlorate***, and then blend the mixture until the bulk of the solvent evaporates and a tacky dough like material remains. Note: copper-I-chloride is water sensitive, so moisture should be avoided. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desirable diameter, and then cure the stars in an oven at moderate temperature. This star may or may not need to be primed.
Burn rate: Very well.
Water resistance: Poor.
Stability: Can be stored for many years if kept absolutely dry.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 7+ (can be ignited using a Nichrome wire).
Tendency to cake: None.
Explosive ability: Very low (avoid contact with heavy metals and ammonium compounds).
Percentage: ***59.63% potassium perchlorate, 14.67% copper-I-chloride, 10.09% PVC, 9.17% sulfur, 6.42% red gum, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-019A: Brilliant blue star composition for aerial fireworks:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 125 milliliters of tetrahydrofuran, and then add and dissolve (partially or fully), ***120 grams of finely grained PVC.*** Thereafter, blend the mixture moderately for about 5 minutes. Thereafter, add in ***130 grams of copper-II-oxide***, followed by ***100 grams of flours of sulfur***, followed by ***100 grams of dextrin***, and then followed by ***630 grams of ammonium perchlorate***, and then blend the mixture until a dough like material is obtained. Thereafter, the material is ready for use. To use, simply roll the mixture into stars of any desirable diameter, and then cure the stars in an oven at moderate temperature in the usual manner. This star may or may not need to be primed.
Burn rate: Good.
Water resistance: Average.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A.
Tendency to cake: None.
Explosive ability: Only under severe conditions.
Percentage: ***58.33% ammonium perchlorate, 12.03% copper-II-oxide, 11.11% PVC, 9.25% sulfur, 9.25% dextrin, 0.03% rounded balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-020A: Brilliant blue star composition for aerial fireworks (sensitized with chlorate/sulfur):
Into an empty ball mill, place ***100 grams of powdered sulfur***, followed by ***100 grams of copper-II-acetoarsenite***, and then followed by ***50 grams of mercury-I-chloride***, and then tumble the mixture for about 30 minutes at 150 RPM. Now, into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 75 milliliters of acetone, and then 75 milliliters of ice water, and then add in the tumbled mixture previously prepared, and then add in ***450 grams of potassium chlorate***, and then blend the mixture for about 15 minutes. Now, if there is any liquid above or below the mixture, filter-off the liquid, and then roll the pasty or dough like mass into stars of any desired diameter, and then cure the stars in an oven at moderate temperature in the usual manner. This star mixture may or may not need to be primed.
Burn rate: Good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 5 ¾ (depends on density).
Tendency to cake: None.
Explosive ability: Only under severe conditions—avoid shock or percussion.
Percentage: ***64.28% potassium chlorate, 14.28% sulfur, 14.28% copper-II-acetoarsenite, 7.14% mercury-I-chloride, 0.02% residue***

Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-020B: Brilliant blue star composition for aerial fireworks (sensitized with chlorate/sulfur):
Into an empty ball mill, place ***120 grams of powdered sulfur***, followed by ***30 grams of lead-II-chloride***, and then followed by ***180 grams of copper-II-sulfate***, and then tumble the mixture for about 30 minutes at 125 RPM. Now, into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 50 milliliters of acetone, and then 50 milliliters of ice water, and then add in the tumbled mixture previously prepared, and then add in ***360 grams of potassium chlorate***, and then blend the mixture for about 15 minutes. Now, if there is any liquid above or below the mixture, filter-off the liquid, and then roll the pasty or dough like mass into stars of any desired diameter, and then cure the stars in an oven at moderate temperature in the usual manner. This star mixture may or may not need to be primed.
Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Stable—avoid percussion and shock.
Percentage: ***52.17% potassium chlorate, 26.08% copper-II-sulfate, 17.39% sulfur, 4.34% lead-II-chloride, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-021A: Brilliant blue star composition for aerial fireworks:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of the usual diameter, place ***50 grams of commercially available rosin***, followed by ***100 grams of soft wood charcoal***, followed by ***120 grams of powdered sulfur***, followed by ***400 grams of meal powder***, and then add in 50 milliliters of diethyl ether. Thereafter, tumble the mixture at 300 RPM for about 1 hour. Note: as in any operation involving a ball mill, the steel shot can be removed by screening the tumbled mixture. Now, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer in the usual manner, and then add in ***400 grams of potassium nitrate***, and then followed by ***300 grams of copper-II-ammonium nitrate compound***. Thereafter, add in 150 milliliters of diethyl ether, and then blend the mixture for about 10 to 15 minutes to form a nice uniform dough like material. Thereafter, simply roll the dough like material into stars of any desired diameter. The rolled stars should be cured in an oven at low temperature until dry and hard. Mixture requires a primer for proper ignition.
Burn rate: Smooth burning.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6
Ease of ignition (1 to 10): 5+ (depends on density).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***29.19% potassium nitrate, 29.19% meal powder, 21.89% copper-II-ammonium nitrate, 8.75% sulfur, 7.29% wood charcoal, 3.64% rosin, 0.05% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-022A: Brilliant blue star composition for aerial fireworks:
Into a suitable mixing drum, bowl, or any other similar container, equipped with motorized stirrer, place 100 milliliters of acetone, and then add in ***131 grams of Parlon compound***, followed by ***123 grams of basic copper-II-carbonate***, followed by ***48 grams of soluble rice starch***, and then followed by ***90 grams of red gum***. Thereafter, blend the mixture for about 10 minutes to form a uniform mixture. Finally, add in ***608 grams of potassium perchlorate***, and then continue to blend the mixture until a uniform dough like material is obtained. Thereafter, the mixture is ready for use. To use, simply roll or cut the stars into any desired diameter, and then cure the stars in an oven at low temperature. These stars may need to be primed.
Burn rate: N/A
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): NA
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60.8% potassium perchlorate, 13.1% Parlon compound, 12.3% copper-II-carbonate, 9% red gum, 4.8% soluble rice starch filler***

Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-023A: Brilliant blue star composition with secondary "crackling effect" for aerial fireworks:

Into a suitable mixing drum, bowl, or any other similar container, equipped with motorized stirrer, place 100 milliliters of acetone, and then add in ***20 grams of high nitrogen content nitrocellulose***, and then blend the mixture for about 5 minutes. Thereafter, add in ***162.2 grams of Lead tetraoxide*** (Pb_3O_4), followed by ***18.2 grams of a "magnalium"*** alloy compound, and then followed by ***18.2 grams of copper-II-oxide***. Thereafter, blend the mixture until a uniform dough like material is obtained. Thereafter, simply roll the stars into any desired diameter, and then cure the stars at room temperature. Note: these stars ignite easily, so avoid friction, heat, sparks, ect. Now, into a separate mixing drum or similar container, equipped with motorized stirrer, place 175 milliliters of acetone, followed by ***50 grams of dextrin***, followed by ***130 grams of Parlon compound***, followed by ***90 grams of red gum***, followed by ***120 grams of copper-II-carbonate***, and then followed by ***610 grams of potassium perchlorate***. Thereafter, blend the mixture until a dough like mixture is obtained. Once it has, the material is ready for rolling. To do so, take the cured stars (obtained in the beginning of the procedure), and then roll the new dough like material on the cured stars to make combined stars of any desired (increased) diameter. Thereafter, these new rolled stars should then be cured at room temperature until dry and hard. The new stars (outer layer) should be primed with a thin layer of any desired prime.
Burn rate: Good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Average—inner crackling star 9+
Ease of ignition (1 to 10): 5+ (inner crackling star has 9+)
Tendency to cake: None.
Explosive ability: None—inner crackling star explodes upon ignition.
Percentage: ***50.05% potassium perchlorate, 13.31% lead tetraoxide, 10.66% Parlon compound, 9.84% copper-II-carbonate, 7.38% red gum, 4.1% dextrin, 1.64% nitrocellulose, 1.49% magnalium, 1.49% copper-II-oxide, 0.04% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars (with a secondary crackling effect) for a variety of aerial devices.

07-02-024A: Brilliant "robins eggs" blue star composition with bushy flame:

Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot, place ***100 grams of finely grained elemental silicon***, followed by ***100 grams of copper-II-oxide***, followed by ***150 grams of finely divided PVC***. Thereafter, tumble the mixture at 300 RPM for about 1 hour. Thereafter, place the tumbled mixture into a clean mixing bowl or container, equipped with motorized stirrer, and then add in 75 milliliters of tetrahydrofuran. Then, add in ***700 grams of potassium perchlorate***, and then blend the mixture for about 30 minutes. Now, add in 75 milliliters of ice water, and then continue to blend the mixture for about 10 minutes. Thereafter, filter-off the insoluble mass, and then place it on a tray and allow it to dry but only until a dough like material is obtained (manually blend periodically). Once a dough like material is obtained, simply roll the material into stars of any desired diameter, and then cure them in an oven at moderate temperature.
Burn rate: N/A
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66.66% potassium perchlorate, 14.28% PVC, 9.52% silicon, 9.52% copper-II-oxide, 0.02% residues***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-025A: Brilliant blue star composition (modified):

Into a suitable mixing bowl, equipped with motorized stirrer, place 75 milliliters of acetone, and then add in ***50 grams of "Saran" compound***, followed by ***125 grams of lactose***, followed by ***125 grams of copper-II-oxy chloride***, and then followed by ***50 grams of dextrin***, and then blend the mixture for about 5 minutes. Thereafter, add in ***650 grams of potassium chlorate***, and then continue to blend the mixture for about 10 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter and cure in the usual manner. The stars should be primes using a potassium perchlorate priming mixture.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 4+

Tendency to cake: None.
Explosive ability: None.
Percentage: ***65% potassium chlorate, 12.5% lactose, 12.5% copper-II-oxychloride, 5% Saran compound, 5% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-026A: Brilliant blue star composition with salmon colored flame edges:

Into a suitable beaker, place ***200 grams of "Fimo"*** (a PVC based modeling clay), and then gently heat the Fimo to soften it up. Now, into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***100 grams of malachite mineral*** (pulverized), and then tumble the mineral at 500 RPM for about 1 hour. Thereafter, add this pulverized mineral into the beaker containing the Fimo compound, followed by 100 milliliters of 99% isopropyl alcohol. Thereafter, blend the warmed mixture for about 30 minutes. Thereafter, add in ***700 grams of ammonium perchlorate***, and then continue to blend the mixture for about 1 hour on moderate speed. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, and then cure in the usual manner. The stars should be primed with any desired primer.
Burn rate: Above Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% ammonium perchlorate, 20% Fimo compound, 10% malachite mineral***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-027A: Brilliant purple star composition:

Into a clean suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***120 grams of powdered sulfur***, followed by ***100 grams of strontium sulfate***, followed by ***50 grams of copper-II-sulfate***, followed by ***20 grams of lead-II-chloride***, and then followed by ***20 grams of fine grained soft wood charcoal***, and then tumble the mixture at 250 RPM for about 30 minutes. Thereafter, remove the tumbled mixture (remember to use a screen to separate the mixture from the steel shot). Thereafter, place this mixture into a suitable mixing drum, equipped with motorized stirrer, and then add in 75 milliliters of acetone. Finally, add in ***360 grams of potassium chlorate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, and then cure the stars in an oven at moderate temperature. The stars should be glazed with a thin layer of primer in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***53.73% potassium chlorate, 17.91% sulfur, 14.92% strontium sulfate, 7.46% copper-II-sulfate, 2.98% lead-II-chloride, 2.98% charcoal, 0.02% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-028A: Brilliant purple star composition:

As in previous examples, into a clean suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***140 grams of powdered sulfur***, followed by ***180 grams of strontium carbonate***, followed by ***40 grams of copper-II-chloride***, and then followed by ***20 grams of lead-II-chloride***, and then tumble the mixture at 150 RPM for about 30 minutes. Thereafter, remove the tumbled mixture (remember to use a screen to separate the mixture from the steel shot). Thereafter, place this mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Finally, add in ***380 grams of potassium chlorate***, and then blend the mixture on moderate speed until a nice dough like material is obtained. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, and then cure the stars in an oven at moderate temperature. The stars should be glazed with a thin layer of primer in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ¾

Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium chlorate, 23.68% strontium carbonate, 18.42% sulfur, 5.26% copper-II-chloride, 2.63% lead-II-chloride, 0.01% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-028B: Brilliant violet star composition: Into a suitable mixing bowl or similar container, place 100 milliliters of ether, followed by ***124 grams of Parlon compound***, followed by ***91 grams of red gum***, followed by ***50 grams of basic copper carbonate***, followed by ***74 grams of strontium carbonate***, followed by ***48 grams of glutinous rice starch***, and then followed by ***613 grams of potassium perchlorate***. Thereafter, blend the mixture for about 5 minutes, and then add in 75 milliliters of additional ether, and then continue to blend the mixture until a nice dough like material is obtained. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.
Burn rate: Below average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): Poor
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.3% potassium perchlorate, 12.4% Parlon compound, 9.1% red gum, 7.4% strontium carbonate, 5% basic copper carbonate, 4.8% rice starch***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-029A: Brilliant yellow star composition: Into a suitable mixing bowl or similar container, place 75 milliliters of water, and then add in ***100 grams of dextrin***, and then blend the mixture for about 5 minutes. Thereafter, add in ***100 grams of sodium bicarbonate***, and then followed by ***300 grams of potassium chlorate***. Thereafter, blend the mixture for about 15 minutes, and then add in 75 milliliters acetone, and then continue to blend the mixture for about 5 minutes. Now, filter-off any liquid, and then place the pasty mass on a shallow tray or pan, and let it dry to a fine dough like material. Once it has, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.
Burn rate: Below average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Poor.
Ease of ignition (1 to 10): Poor.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% potassium chlorate, 20% sodium bicarbonate, 20% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-030A: Brilliant yellow star composition: Into a suitable mixing bowl or similar container, place 75 milliliters of 95% ethyl alcohol, and then add in ***100 grams of finely powdered lampblack***, and then add in ***150 grams of sodium oxalate***, and then followed by ***400 grams of potassium chlorate***. Thereafter, blend the mixture for about 15 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.
Burn rate: Ok.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.53% potassium chlorate, 23.07% sodium oxalate, 15.38% lampblack, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-030B: Brilliant yellow star composition for aerial use:
As in the previous example, into a suitable mixing bowl or similar container, place 75 milliliters of 95% ethyl alcohol, and then add in ***100 grams of finely shellac***, followed by ***50 grams of dextrin***, and then blend the mixture for about 10 minutes. Now, add in ***200 grams of sodium oxalate***, and then followed by ***400 grams of potassium chlorate***. Thereafter, blend the mixture for about 15 minutes. Now, add in 75 milliliters of ice-cold water, and then continue to blend the mixture for about 15 minutes. Thereafter the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***53.33% potassium chlorate, 26.66% sodium oxalate, 13.33% shellac, 6.66% dextrin, 0.02% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-030C: Brilliant yellow star composition for aerial use:
As in the previous example, into a suitable mixing bowl or similar container, place 175 milliliters of acetone, and then add in ***100 grams of finely powdered soft wood charcoal***, followed by ***240 grams of sulfur***, followed by ***20 grams of rosin***, and then blend the mixture for about 10 minutes. Now, add in ***600 grams of meal powder***, and then followed by ***480 grams of potassium nitrate***. Thereafter, blend the mixture until a dough like material is obtained. Once a dough like material is obtained, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.
Burn rate: Below moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.66% meal powder, 33.33% potassium nitrate, 16.66% sulfur, 6.94% wood charcoal, 1.38% rosin, 0.03% balance (un rounded)***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-030D: Brilliant yellow star composition for aerial use (fortified with magnesium):
Into a suitable ball mill (empty), place 5 milliliters of linseed oil, and then add in ***150 grams of 60 mesh magnesium powder***. Thereafter, tumble the mixture for about 15 minutes at low RPM to coat the magnesium grains with the linseed oil. Now, into a suitable mixing bowl or similar container, place 75 milliliters of 99% isopropyl alcohol, followed by 50 milliliters of ice water, and then add in the coated magnesium grains, followed by ***50 grams of powdered PVC***, followed by ***10 grams of lampblack***, followed by ***65 grams of ultramarine compound,*** and then followed by ***225 grams of potassium perchlorate***, and then blend the mixture for about 30 minutes. Thereafter, place the mixture on a shallow tray or pan, and allow it to thoroughly air dry. Now, place the mixture into a suitable ball mill, filled with 250 grams of heavy Teflon coated steel shot, and then tumble the mixture for about 30 minutes to form a uniform powder. Finally, place blended mixture into a suitable mixing bowl, equipped with motorized stirrer, followed by 125 milliliters of ether, and then blend the mixture to form a dough like material. Once a dough like material is obtained, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.
Burn rate: Good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% potassium perchlorate, 30% magnesium powder, 13% ultramarine, 10% PVC, 2% lampblack***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-031A: Orange star composition for aerial use:

Into a suitable mixing bowl or similar container, place 125 milliliters of 99% isopropyl alcohol, followed by *50 grams of shellac*, followed by *30 grams of flours of sulfur*, and then blend the mixture for about 10 minutes. Thereafter, add in *50 grams of potassium chlorate*, followed by *80 grams of sodium oxalate*, and then followed by *360 grams of strontium nitrate*. Thereafter, continue to blend the mixture for about 15 minutes to form a uniform dough. Once a dough like material is obtained, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.

Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63.15% strontium nitrate, 14.03% sodium oxalate, 8.77% shellac, 8.77% potassium chlorate, 5.26% sulfur, 0.02% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-031B: Orange star composition for aerial use:

Into a suitable beaker or similar container, place *220 grams of "FIMO" PVC modeling clay*, and then gently heat the mixture to soften it up. Thereafter, while maintaining a gentle heat, add in *20 grams of iron-III-oxide*, followed by *350 grams of strontium nitrate*, and then followed by *400 grams of potassium perchlorate*. Thereafter, blend the mixture for about 15 minutes to form a uniform mass. Now, remove the heat source, and then place the mixed material into a clean mixing bowl or similar container, equipped with motorized stirrer, and then add in 175 milliliters of 99% isopropyl alcohol, and then blend the mixture to form a dough like material. Once a dough like material is obtained, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.

Burn rate: Unknown.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.40% potassium perchlorate, 35.35% strontium nitrate, 22.22% FIMO, 2.02% iron-III-oxide, 0.01% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.

07-02-032A: Brilliant white star composition for aerial use:

Into a suitable empty ball mill, place *290 grams of potassium nitrate*, followed by *200 grams of standard commercially available aluminum flake*, and then tumble the mixture on low RPM for about 1 hour. Thereafter, remove the tumbled mixture using a screen in the usual manner, and then place this tumbled mixture into a clean mixing bowl or similar container, equipped with motorized stirrer, and then add in 100 milliliters of ether. Thereafter, add in *10 grams of dextrin*, and then blend the entire mixture for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.

Burn rate: Very good.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: May explode if confined.
Percentage: ***58% potassium nitrate, 40% aluminum flake, 2% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making white stars for a variety of aerial devices.

07-02-032B: Brilliant white star composition for aerial use:

Into a suitable empty ball mill, place *120 grams of soft wood charcoal*, followed by *320 grams of magnesium powder*, and then followed by *160 grams of flours of sulfur*. Thereafter, tumble the mixture on moderate RPM for about 1 hour. Thereafter, remove the tumbled mixture using a screen in the usual manner, and then place this tumbled mixture into a clean mixing bowl or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in *400 grams of potassium perchlorate*, and then blend the entire mixture to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.

Burn rate: Above normal.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: May explode if confined.
Percentage: ***40% potassium perchlorate, 32% magnesium, 16% sulfur, 12% wood charcoal***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making white stars for a variety of aerial devices.

07-02-033A: Brilliant white star composition for aerial use:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 75 milliliters of 99% isopropyl alcohol, followed by 75 milliliters of ice-cold water. Immediately thereafter, add in *70 grams of Parlon compound*, followed by *280 grams of 100 mesh magnesium powder*, followed by *120 grams of potassium nitrate*, and then followed by *530 grams of barium nitrate*. Thereafter, blend the mixture on moderate speed for about 15 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the dough like material into stars of any desired diameter, and then cure them in an oven under moderate temperature until dry and hard. The stars should be primed in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***53% barium nitrate, 28% magnesium, 12% potassium nitrate, 7% Parlon compound***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making white stars for a variety of aerial devices.

07-02-032C: Brilliant white star composition for aerial use:

Into a suitable empty ball mill, place *200 grams of magnesium powder* of average commercial mesh, followed by *600 grams of strontium nitrate*, and then tumble the mixture on low RPM for about 30 minutes. Thereafter, remove the tumbled mixture using a screen in the usual manner, and then place this tumbled mixture into a clean mixing bowl or similar container, equipped with motorized stirrer, and then add in 150 milliliters of tetrahydrofuran. Thereafter, add in *200 grams of fine-grained PVC*, and then blend the entire mixture for about 15 minutes. Now, add in 75 milliliters of ice water, and then continue to blend the mixture for about 30 minutes. Thereafter, filter-off any liquid, or filter-off the insoluble mass, and then allow it to dry on a shallow tray or pan and allow it to dry but only to the point where a fine dough like material remains. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.

Burn rate: Above moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Very unlikely even under severe conditions.
Percentage: ***60% strontium nitrate, 20% magnesium, 20% PVC***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making white stars for a variety of aerial devices.

07-02-033A: Brilliant white star composition for aerial use:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 125 milliliters of acetone, followed by 75 milliliters of ice-cold water. Thereafter, add in *310 grams of finely powdered aluminum flake* of average commercial importance, followed by *80 grams of Lycopodium compound*, and then followed by *610 grams of potassium perchlorate*. Thereafter, blend the mixture for about 30 minutes. Thereafter, filter-off the insoluble mass, and then place the filtered-off mass onto a shallow pan or tray, and then allow the mixture to thoroughly air dry. Once it has, place the dried mass into a suitable ball mill, filled with 250 grams of heavy Teflon coated steel shot, and then tumble the mixture for about 45 minutes to form a uniform powder. Now, place the tumbled mixture into a clean mixing bowl, equipped with clean motorized stirrer, and then add in 150 milliliters of 95% ethyl alcohol, and then blend the mixture for about 1 hour to form a nice dough like material. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.

Burn rate: Above moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: Very unlikely even under severe conditions—however may explode when confined.
Percentage: ***61% potassium perchlorate, 31% aluminum flake, 8% Lycopodium compound***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making white stars for a variety of aerial devices.

07-02-034A: Brilliant white star composition for aerial use:

Into a suitable mixing drum, filled with 150 grams of heavy Teflon coated steel shot, place 125 milliliters of 95% ethyl alcohol. Thereafter, add in ***100 grams of antimony sulfide***, followed by ***50 grams of flours of sulfur***, and then followed by ***300 grams of potassium nitrate***. Thereafter, tumble the mixture at 100 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at moderate temperature in the usual manner. The stars should be primed in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: May explode when confined or under severe percussion.
Percentage: ***66.66% potassium nitrate, 22.22% antimony sulfide, 11.11% sulfur, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making white stars for a variety of aerial devices.

07-02-034B: Brilliant white star composition for aerial use (fortified with dextrin):

Into a suitable mixing drum, filled with 150 grams of heavy Teflon coated steel shot, place 125 milliliters of 95% ethyl alcohol. Thereafter, add in ***120 grams of antimony sulfide***, followed by ***160 grams of flours of sulfur***, followed by ***30 grams of dextrin***, and then followed by ***560 grams of potassium nitrate***. Thereafter, tumble the mixture at 100 RPM for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at moderate temperature in the usual manner. The stars should be primed in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: May explode when confined or under severe percussion.
Percentage: ***64.36% potassium nitrate, 18.39% sulfur, 13.79% antimony sulfide, 3.44% dextrin, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making white stars for a variety of aerial devices.

07-02-035A: Brilliant orange star composition for aerial use:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 175 milliliters of 95% ethyl alcohol. Thereafter, add in ***150 grams of shellac***, followed by ***100 grams of powdered cryolite***, and then followed by ***750 grams of potassium perchlorate***. Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at average temperature in the usual means. Prime the stars with any desired primer.

Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): N/A (probably around 6+)

Tendency to cake: None.
Explosive ability: Stable—will explode if confined and ignited.
Percentage: ***75% potassium perchlorate, 15% shellac, 10% cryolite synthetic mineral***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making orange stars for a variety of aerial devices.

07-02-035B: Brilliant yellow star composition for aerial use (fortified with dextrin):

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 175 milliliters of 95% ethyl alcohol. Thereafter, add in ***100 grams of shellac***, followed by ***100 grams of finely powdered PVC***, followed by ***100 grams of powdered cryolite mineral***, and then followed by ***700 grams of potassium perchlorate***. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at average temperature in the usual means. Prime the stars with any desired primer.

Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: Stable—will explode if confined and ignited.
Percentage: ***70% potassium perchlorate, 10% shellac, 10% cryolite synthetic mineral, 10% PVC***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making yellow stars for a variety of aerial devices.

07-02-036A: Brilliant red star composition for aerial use (fortified with dextrin):

Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of strontium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate***, and then blend the mixture on moderate speed until a dough like material is obtained. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at average temperature in the usual means. Prime the stars with any desired primer.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.88% potassium perchlorate, 14.42% Parlon compound, 14.42% strontium carbonate, 8.65% red gum, 5.76% magnalium alloy, 3.84% dextrin, 0.03% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making red stars for a variety of aerial devices.

07-02-036B: Brilliant orange star composition for aerial use (fortified with dextrin):

Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of calcium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate***, and then blend the mixture on moderate speed until a dough like material is obtained. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at average temperature in the usual means. Prime the stars with any desired primer.

Burn rate: Very similar to 07-02-036A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.88% potassium perchlorate, 14.42% Parlon compound, 14.42% calcium carbonate, 8.65% red gum, 5.76% magnalium alloy, 3.84% dextrin, 0.03% residue***

Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making orange stars for a variety of aerial devices.

07-02-036C: Brilliant green star composition for aerial use (fortified with dextrin):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of barium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***50 grams of red gum***, and then followed by ***110 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***300 grams of potassium perchlorate***, and then followed by ***240 grams of barium nitrate***, and then blend the mixture on moderate speed until a dough like material is obtained. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at average temperature in the usual means. Prime the stars with any desired primer.
Burn rate: Similar to 07-02-036B
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¼
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***28.84% potassium perchlorate, 23.07% barium nitrate, 14.42% Parlon compound, 14.42% calcium carbonate, 10.57% magnalium 50/50 alloy, 4.8% red gum, 3.84% dextrin, 0.04% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making green stars for a variety of aerial devices.

07-02-036D: Brilliant blue star composition for aerial use (fortified with dextrin):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate***, and then blend the mixture on moderate speed until a dough like material is obtained. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at average temperature in the usual means. Prime the stars with any desired primer.
Burn rate: Similar to 07-02-036C
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.88% potassium perchlorate, 14.42% Parlon compound, 14.42% calcium carbonate, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 0.03% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making blue stars for a variety of aerial devices.

07-02-037A: Brilliant yellow star composition for aerial use (Complex mixture A):
Step 1 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of barium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***50 grams of red gum***, followed by ***110 grams of Magnalium 50/50 alloy***, followed by ***240 grams of barium nitrate***, and then followed by ***300 grams of potassium perchlorate.*** Thereafter, tumble the mixture for about1 hour at moderate RPM. Thereafter, save this mixture for after step 2.
Step 2 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of calcium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, followed by ***60 grams of Magnalium 50/50 alloy***, and then followed by ***550 grams of potassium perchlorate***. Thereafter, tumble the mixture for about1 hour at moderate RPM. Thereafter, save the mixture for step 3.
Step 3 (final product):
Now, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***572 grams of the mixture obtained in step 1***, followed by ***468 grams of the mixture obtained in step 2***, and then add in 200 milliliters of 99% isopropyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Note: more alcohol can be added if the mixture is too dry. Thereafter the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure the stars in an oven at moderate temperature until the stars are hard and dry. The stars should be primed in the usual manner.
Burn rate: Average.

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***39.66% potassium perchlorate, 14.42% Parlon, 12.69% barium nitrate, 8.41% magnalium 50/50 alloy, 7.93% barium carbonate, 6.53% red gum, 6.49% calcium carbonate, 3.84% dextrin, 0.03% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making yellow stars for a variety of aerial devices.

07-02-037B: Brilliant purple star composition for aerial use (Complex mixture B):
Step 1 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 4.
Step 2 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of calcium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 4.
Step 3: (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of strontium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate***, and then blend the mixture on moderate speed for 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 4.
Step 4 (final product):
Now, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***832 grams of mixture obtained in step 1***, followed by ***52 grams of the mixture obtained in step 2***, and then followed by ***156 grams of the mixture obtained in step 3***, and then add in 200 milliliters of 99% isopropyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Note: more alcohol can be added if the mixture is too dry. Thereafter the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure the stars in an oven at moderate temperature until the stars are hard and dry. The stars should be primed in the usual manner.
Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.88% potassium perchlorate, 14.42% Parlon, 11.53% copper-II-oxide, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 2.16% strontium carbonate, 0.72% calcium carbonate, 0.04% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making purple stars for a variety of aerial devices.

07-02-037C: Brilliant "peach colored" star composition for aerial use (Complex mixture C):
Step 1 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container,

equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 4.

Step 2 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of calcium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 4.

Step 3: (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of strontium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 4.

Step 4 (final product):
Now, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***156 grams of mixture obtained in step 1***, followed by ***624 grams of the mixture obtained in step 2***, and then followed by ***260 grams of the mixture obtained in step 3***, and then add in 200 milliliters of 99% isopropyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Note: more alcohol can be added if the mixture is too dry. Thereafter the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure the stars in an oven at moderate temperature until the stars are hard and dry. The stars should be primed in the usual manner.

Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.88% potassium perchlorate, 14.42% Parlon, 8.65% calcium carbonate, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.6% strontium carbonate, 2.16% copper-II-oxide, 3.84% dextrin, 0.04% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making peach colored stars for a variety of aerial devices.

07-02-037D: Brilliant "maroon colored" star composition for aerial use (Complex mixture D):

Step 1 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 2 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of strontium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 3 (final product):
Now, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***156 grams of the mixture obtained in step 1***, followed by ***884 grams of the mixture obtained in step 2***, and then add in 200 milliliters of 99% isopropyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Note: more alcohol can be added if the mixture is too dry. Thereafter the

mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure the stars in an oven at moderate temperature until the stars are hard and dry. The stars should be primed in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.88% potassium perchlorate, 14.42% Parlon, 12.25% strontium carbonate, 8.65% red gum, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 2.16% copper-II-oxide, 0.04% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making maroon colored stars for a variety of aerial devices.

07-02-037E: Brilliant "magenta colored" star composition for aerial use (Complex mixture E):

Step 1 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 2 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of strontium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 3 (final product):
Now, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***520 grams of the mixture obtained in step 1***, followed by ***520 grams of the mixture obtained in step 2***, and then add 200 milliliters of 99% isopropyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Note: more alcohol can be added if the mixture is too dry. Thereafter the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure the stars in an oven at moderate temperature until the stars are hard and dry. The stars should be primed in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.88% potassium perchlorate, 14.42% Parlon, 8.65% red gum, 7.21% strontium carbonate, 7.21% copper-II-oxide, 5.76% magnalium 50/50 alloy, 3.84% dextrin, 0.03% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making magenta colored stars for a variety of aerial devices.

07-02-037F: Brilliant "Turquoise colored" star composition for aerial use (Complex mixture F):

Step 1 (batch process):
Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of barium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***50 grams of red gum***, and then followed by ***110 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***300 grams of potassium perchlorate,*** and then followed by ***240 grams of barium nitrate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 2 (batch process):

Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 3 (final product):

Now, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***572 grams of the mixture obtained in step 1***, followed by ***468 grams of the mixture obtained in step 2***, and then add in 200 milliliters of 99% isopropyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Note: more alcohol can be added if the mixture is too dry. Thereafter the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure the stars in an oven at moderate temperature until the stars are hard and dry. The stars should be primed in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *39.66% potassium perchlorate, 14.42% Parlon, 12.69% barium nitrate, 8.41% magnalium 50/50 alloy, 7.93% barium carbonate, 6.53% red gum, 6.49% copper-II-oxide, 3.84% dextrin, 0.03% balance*
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making turquoise colored stars for a variety of aerial devices.

07-02-037G: Brilliant "aqua colored" star composition for aerial use (Complex mixture G):

Step 1 (batch process):

Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of barium carbonate***, followed by ***150 grams of Parlon compound***, followed by ***50 grams of red gum***, and then followed by ***110 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***300 grams of potassium perchlorate,*** and then followed by ***240 grams of barium nitrate***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 2 (batch process):

Into a empty ball mill, place ***40 grams of dextrin***, followed by ***150 grams of copper-II-oxide***, followed by ***150 grams of Parlon compound***, followed by ***90 grams of red gum***, and then followed by ***60 grams of Magnalium 50/50 alloy***, and then tumble the mixture for about1 hour at moderate RPM. Thereafter, place this tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 125 milliliters of acetone. Thereafter, add in ***550 grams of potassium perchlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air dry. Once it has, place it into a clean ball mill, filled with 200 grams of heavy Teflon coated steel shot, and then tumble the mixture on moderate RPM for about 1 hour to form a uniform mixture. Thereafter, save the mixture for step 3.

Step 3 (final product):

Now, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***832 grams of the mixture obtained in step 1***, followed by ***208 grams of the mixture obtained in step 2***, and then add in 200 milliliters of 99% isopropyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Note: more alcohol can be added if the mixture is too dry. Thereafter the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure the stars in an oven at moderate temperature until the stars are hard and dry. The stars should be primed in the usual manner.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *33.65% potassium perchlorate, 18.46% barium nitrate 14.42% Parlon, 11.53% barium carbonate, 9.61% magnalium 50/50 alloy, 5.57% red gum, 3.84% dextrin, 2.88% copper-II-oxide, 0.04% balance*
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making aqua colored stars for a variety of aerial devices.

Section 3: Firework Effects Stars

- Firework Effects Star Compositions in this section -

1. 07-03-001A: Brilliant "white flare" star composition for multiple purposes: *62.32% barium nitrate, 22.60% potassium nitrate, 4.24% sulfur, 4.24% barium chlorate, 3.42% aluminum, 2.46% magnesium powder, 0.68% coarse aluminum grain, 0.04% impurities*	**2. 07-03-002A: Brilliant "gold flitter" star composition for multiple purposes:** *35.55% potassium nitrate, 24.44% gray aluminum powder, 11.11% flake aluminum, 8.88% sodium oxalate, 8.88% dextrin, 6.66% sulfur, 4.44% charcoal, 0.04% mixed balance*
3. 07-03-003A: "Zinc spreader" star composition for multiple purposes: *63.71% zinc dust, 13.27% potassium chlorate, 10.61% charcoal, 10.61% potassium dichromate, 1.76% dextrin, 0.04% residue*	**4. 07-03-003B: "Zinc spreader" star composition for multiple purposes:** *61.53% zinc dust, 21.53% potassium nitrate, 10.76% granular charcoal, 6.15% sulfur, 0.03% mixed balance*
5. 07-03-003C: "Zinc spreader" star composition for multiple purposes: *64.86% zinc dust, 13.51% potassium chlorate, 10.81% charcoal, 10.81% potassium dichromate, 0.02% balance*	**6. 07-03-004A: "Willow tree" star composition for multiple purposes:** *52.84% lampblack, 29.41% potassium chlorate, 14.7% potassium nitrate, 2.94% sulfur, 0.11 mixed balance*
7. 07-03-005A: "Willow" star composition for multiple purposes (lampblack special): *30.61% potassium perchlorate, 30.61% lampblack, 25.51% charcoal, 5.1% shellac, 5.1% dextrin, 3.06% potassium nitrate, 0.01% residual balance*	**8. 07-03-005B: "Willow" star composition for multiple purposes (lampblack special):** *54.54% lampblack, 36.36% potassium chlorate, 4.54% dextrin, 4.54% potassium nitrate, 0.02% impurities balance*
9. 07-03-006A: Beautiful Silver shower star composition for multiple purposes: *32.96% potassium perchlorate, 19.23% potassium nitrate, 13.73% aluminum bronze, 10.98% atomized aluminum, 8.24% flake aluminum, 5.49% dextrin, 4.39% soft wood charcoal, 3.84% sulfur, 1.09% boric acid, 0.05% residual balance*	**10. 07-03-006B: Beautiful Silver shower star composition for multiple purposes (reduced component):** *61.9% ammonium perchlorate, 20.95% aluminum flake, 17.14% shellac, 0.01% residue*
11. 07-03-006C: Beautiful Silver shower star composition for multiple purposes (modified): *63.21% potassium nitrate, 17.24% flitter aluminum, 11.49% wood charcoal, 5.74% dextrin, 2.29% boric acid, 0.03% balance*	**12. 07-03-007A: "Electric" star composition for multiple purposes:** *44.44% potassium nitrate, 14.81% sulfur, 14.81% coarse aluminum, 11.11% antimony sulfide, 7.4% aluminum powder, 7.4% black powder, 0.03% residues*
13. 07-03-007B: "Electric" star composition for multiple purposes: *68.18% potassium chlorate, 10.22% aluminum, 5.68% dextrin, 5.68% barium nitrate, 4.54% medium coarse aluminum, 3.4% coarse aluminum, 2.27% flours of sulfur, 0.03% mixed balance*	**14. 07-03-007C: "Electric" star composition for multiple purposes:** *71.42% aluminum powder, 21.42% potassium perchlorate, 3.57% dextrin, 3.57% barium nitrate, 0.02% balance*
15. 07-03-007D: "Electric" star composition for multiple purposes (reduced component): *57.14% potassium perchlorate, 28.57% medium coarse aluminum, 14.28% dextrin, 0.01% residual balance*	**16. 07-03-008A: "FireFly" star composition for multiple purposes:** *47.61% potassium nitrate, 27.61% air floated charcoal, 10% 80-mesh charcoal, 5.71% sulfur, 4.76% dextrin, 4.28% large flaked aluminum, 0.03% mixed balance*
17. 07-03-008B: "FireFly" star composition for multiple purposes (modified for use as a rocket propellant): *47.04% potassium nitrate, 33.03% air floated charcoal, 5.8% antimony trisulfide, 5.2% dextrin, 4.7% sulfur, 4.2% spherical aluminum, 0.03% impurities*	**18. 07-03-008C: "FireFly" star composition for multiple purposes (producing brilliant fire trails with secondary sparkle effect):** *43.36% potassium nitrate, 25.66% air floated charcoal, 9.73% charcoal powder, 8.84% dextrin, 7.96% sulfur, 4.42% medium coarse aluminum, 0.03% balance*
19. 07-03-009A: "Glitter" star composition for multiple purposes: *55% potassium nitrate, 16% antimony trisulfide, 10% sulfur, 10% lampblack, 5% aluminum, 4% dextrin*	**20. 07-03-010A: "Beautiful "Red Pill" star composition for multiple purposes:** *64% potassium chlorate, 19% strontium carbonate, 13% red gum, 4% dextrin*
21. 07-03-011A: Simplified sparkler star composition for multiple purposes: *60% potassium perchlorate, 30% coarse aluminum, 10% dextrin*	**22. 07-03-012A: "White flitter" star composition for multiple purposes:** *44.73% potassium nitrate, 26.31% fine aluminum flake, 10.52% coarse aluminum, 7.89% soft wood charcoal, 7.89% sulfur, 2.63% dextrin, 0.03% residual balance*
23. 07-03-013A: "White comet" star composition for multiple purposes: *58.18% potassium nitrate, 26.66% soft wood charcoal, 9.09% sulfur, 6.06% dextrin, 0.01% balance*	**24. 07-03-013B: "White comet" star composition for multiple purposes (modified composition):** *49.38% potassium nitrate, 29.62% hard wood charcoal, 11.11% dextrin, 9.87% sulfur, 0.02% balance*
25. 07-03-014A: Classic "Dragon eggs" crackling star composition: *74.36% lead tetraoxide, 9.09% nitrocellulose, 8.27% copper-II-oxide, 8.27% magnalium alloy, 0.01% impurities*	**26. 07-03-014B: Classic "Dragon eggs" crackling star composition (modified with bismuth trioxide):** *74.36% bismuth trioxide, 9.09% nitrocellulose, 8.27% copper-II-oxide, 8.27% magnalium alloy, 0.01% impurities*

27. 07-03-015A: Brilliant blue star with fiery trail: *66.66% ammonium perchlorate, 9.52% copper carbonate, 9.52% red gum, 9.52% soft wood charcoal, 4.76% dextrin, 0.02% residual balance*	**28. 07-03-016A: Brilliant "electric" purple star:** *64.76% potassium perchlorate, 11.42% strontium carbonate, 7.61% copper-II-carbonate, 6.66% hexamine, 4.76% dextrin, 4.76% magnalium 50/50 alloy, 0.03% mixed balance*
29. 07-03-017A: Brilliant "flash" composition for stars: *66% barium nitrate, 27% aluminum flake, 6% glutinous rice starch, 1% boric acid*	**30. 07-03-017B: Brilliant "flash" composition with silver effect:** *56% potassium perchlorate, 32% aluminum flake, 5% rice starch, 5% rosin, 2% lampblack*
31. 07-03-018A: Brilliant "silver wave" star composition with silver tail: *47.61% potassium perchlorate, 47.61% coarse aluminum, 4.76% rice starch, 0.02% balance*	**32. 07-03-019A: Beautiful "golden wave" star composition with gold tail:** *47% coarse aluminum, 37% potassium nitrate, 9% antimony trisulfide, 6% glutinous rice starch, 1% boric acid*
33. 07-03-019B: Beautiful "golden wave" star composition with gold tail (sulfur based): *47% coarse aluminum, 37% potassium nitrate, 9% sulfur, 6% glutinous rice starch, 1% boric acid*	**34. 07-03-020A: Beautiful "Chrysanthemum" star composition:** *40.40% potassium nitrate, 30.30% flake aluminum, 10.10% sulfur, 10.10% realgar mineral, 7.07% glutinous rice starch, 1.01% boric acid, 1.01% hemp coal, 0.01% balance*
35. 07-03-021A: Beautiful "charcoal" fire dust star composition producing a reddish effect: *55% potassium nitrate, 33% willow charcoal, 7% sulfur, 5% rice starch*	**36. 07-03-021B: Beautiful "charcoal" fire dust star composition producing a reddish effect (modified):** *49% potassium nitrate, 40% willow charcoal, 6% sulfur, 5% rice starch*
37. 07-03-021C: Beautiful "charcoal" fire dust star composition producing a reddish effect (modified 2): *44% potassium nitrate, 44% willow charcoal, 6% sulfur, 6% rice starch*	**38. 07-03-022A: Gorgeous "silver wave chrysanthemum" fire dust star producing a reddish/yellow/green twinkling effect:** *50% potassium nitrate, 17.5% sulfur, 7.5% realgar, 7.5% wood charcoal, 7.5% coarse aluminum flake, 6% glutinous rice starch, 2.5% antimony trisulfide, 1.5% magnalium 50/50 alloy*
39. 07-03-023A: Metal fire dust star composition: *38% potassium nitrate, 14% barium nitrate, 13% sulfur, 12% atomized aluminum, 10% wood charcoal, 8% iron-III-oxide, 5% dextrin*	**40. 07-03-023B: Metal fire dust star composition (modified):** *41.74% potassium nitrate, 12.62% barium nitrate, 12.62% sulfur, 12.62% atomized aluminum, 9.7% wood charcoal, 6.79% iron-III-oxide, 3.88% dextrin, 0.03% mixed residue*
41. 07-03-023C: Metal fire dust star composition (modified 2): *40% potassium nitrate, 13% barium nitrate, 12% sulfur, 12% atomized aluminum, 12% wood charcoal, 7% iron-III-oxide, 4% dextrin*	**42. 07-03-024A: Brilliant comet composition for combination use:** *50% potassium chlorate, 23% barium benzoate, 10% barium carbonate, 10% exfoliated mica, 6% bentonite clay, 1% guar gum*
43. 07-03-024B: Brilliant comet composition for combination use (containing zirconium silicate substitute): *50% potassium chlorate, 30% zirconium silicate, 10% bentonite clay, 9% barium carbonate, 1% guar gum*	

07-03-001A: Brilliant "white flare" star composition for multiple purposes:
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place ***50 grams of fine aluminum grain***, followed by ***10 grams of medium coarse aluminum grain***, followed by ***36 grams of magnesium powder*** of average mesh, followed by ***62 grams of flours of sulfur***. Thereafter, add in 250 milliliters of 95% ethyl alcohol, and then blend the mixture for about 5 minutes. Thereafter, add in 100 milliliters of acetone, and then add in ***330 grams of finely powdered potassium nitrate***, followed by ***62 grams of barium chlorate***, and then followed by ***910 grams of barium nitrate***, and then continue to blend the mixture for about 30 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner, but this is not necessarily needed.

Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 5 ¾ +
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***62.32% barium nitrate, 22.60% potassium nitrate, 4.24% sulfur, 4.24% barium chlorate, 3.42% aluminum, 2.46% magnesium powder, 0.68% coarse aluminum grain, 0.04% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making "white flare" stars for multiple uses.

07-03-002A: Brilliant "gold flitter" star composition for multiple purposes:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, place 75 milliliters of ether, followed by ***150 grams of flours of sulfur***, followed by ***100 grams of fine powdered charcoal***, and then followed by ***200 grams of sodium oxalate***. Thereafter, tumble the mixture on low RPM for about 40 minutes. Now, into a suitable mixing bowl, equipped with motorized stirrer, place ***200 grams of dextrin***, followed by ***250 grams of flake aluminum***, followed by ***550 grams of fine "gray" aluminum powder***, and then followed by 250 milliliters of ether, and then blend the mixture on moderate speed for about 20 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean separate ball mill, filled with 250 grams of heavy Teflon coated steel shot, and then tumble the mixture for about 30 minutes to form a uniform powder. Finally, place the tumbled mixture (containing the sodium oxalate), into a clean mixing bowl, and then add in the second tumbled mixture containing the aluminum. Now, add in 500 milliliters of acetone, and then finally add in ***800 grams of finely powdered potassium nitrate***, and then blend the mixture for about 1 hour to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner, but this is not necessarily needed. This composition can also be used for making tail fires for rockets and the like. In essence, this mixture can be used in almost any pyrotechnic munition, such as cones, flares, buzz-bombs, ect.,
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): Average.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35.55% potassium nitrate, 24.44% gray aluminum powder, 11.11% flake aluminum, 8.88% sodium oxalate, 8.88% dextrin, 6.66% sulfur, 4.44% charcoal, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making "gold flitter" stars for multiple uses.

07-03-003A: "Zinc spreader" star composition for multiple purposes:
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place ***100 grams of dextrin***, followed by ***600 grams of potassium dichromate***, followed by ***600 grams of granular charcoal (not powder).*** Note: the diameter of the charcoal should range from 1 to 1.5 millimeters in diameter. Thereafter, add in ***750 grams of potassium chlorate***, and then followed by ***3600 grams of zinc dust***. Thereafter, add in 750 milliliters of ethyl acetate or hexane, and then blend the mixture for about 1 hour to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. Note: for use in aerial devices, use a heavier propulsion charge, as this mixture is heavier then normal compositions. The material can be primed in the usual manner, but this is not necessarily needed. This composition can also be used for making tail fires for rockets and the like, and in essence, can be used in almost any pyrotechnic munitions, such as cones, flares, ect.,
Burn rate: steady but fragmented. This composition produces brilliant sparks of burning zinc and charcoal.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***63.71% zinc dust, 13.27% potassium chlorate, 10.61% charcoal, 10.61% potassium dichromate, 1.76% dextrin, 0.04% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making "zinc spreader" stars for multiple uses.

07-03-003B: "Zinc spreader" star composition for multiple purposes:
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place ***140 grams of granular charcoal (not powder).*** Note: the diameter of the charcoal should range from 1 to 1.5 millimeters in diameter. Thereafter, add in ***280 grams of potassium nitrate***, followed by ***80 grams of flours of sulfur***, and then followed by ***800 grams of zinc dust*** (average commercial availability). Thereafter, add in 250 milliliters of hexane, and then blend the mixture for about 1 hour to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. Note: for use in aerial devices, use a heavier propulsion charge, as this mixture is heavier then normal compositions. The material can be primed in the usual manner, but this is not necessarily needed. This composition can

also be used for making tail fires for rockets and the like, and in essence, can be used in almost any pyrotechnic munitions, such as cones, flares, ect.,
Burn rate: steady but fragmented. This composition produces brilliant sparks of burning zinc and charcoal.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***61.53% zinc dust, 21.53% potassium nitrate, 10.76% granular charcoal, 6.15% sulfur, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making "zinc spreader" stars for multiple uses.

07-03-003C: "Zinc spreader" star composition for multiple purposes:
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place ***120 grams of granular charcoal (not powder).*** Note: the diameter of the charcoal should range from 1 to 1.5 millimeters in diameter. Thereafter, add in ***120 grams of potassium dichromate***, followed by ***720 grams of zinc dust***, and then followed by ***150 grams of potassium chlorate***. Thereafter, add in 175 milliliters of 95% ethyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. Note: for use in aerial devices, use a heavier propulsion charge, as this mixture is heavier then normal compositions. The material can be primed in the usual manner, but this is not necessarily needed. This composition can also be used for making tail fires for rockets and the like, and in essence, can be used in almost any pyrotechnic munitions, such as cones, flares, ect.,
Burn rate: steady but fragmented. This composition produces brilliant sparks of burning zinc and charcoal.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***64.86% zinc dust, 13.51% potassium chlorate, 10.81% charcoal, 10.81% potassium dichromate, 0.02% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making "zinc spreader" stars for multiple uses.

07-03-004A: "Willow tree" star composition for multiple purposes:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot, place ***540 grams of finely powdered lampblack***, followed by ***30 grams of flours of sulfur***, and then followed by ***150 grams of potassium nitrate***, and then tumble the mixture on moderate RPM for about 30 minutes. Thereafter, into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place the tumbled mixture obtained previously, and then add in ***300 grams of potassium chlorate***. Now, add in 150 milliliters of 95% ethyl alcohol, and then blend the mixture for about 1 hour to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner. This composition can also be used for making tail fires for rockets and the like, and may be used in cones if desired.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.84% lampblack, 29.41% potassium chlorate, 14.7% potassium nitrate, 2.94% sulfur, 0.11 mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in tail fires, and for aerial devices.

07-03-005A: "Willow" star composition for multiple purposes (lampblack special):
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot, place ***300 grams of finely powdered lampblack***, followed by ***50 grams of shellac***, followed by ***50 grams of dextrin***, and then followed by ***250 grams of fine grained charcoal***, and then tumble the mixture on moderate RPM for about 1 hour. Thereafter, into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place the tumbled mixture obtained previously, and then add in ***300 grams of potassium perchlorate,*** and then

followed by ***30 grams of potassium nitrate.*** Now, add in 125 milliliters of water, and then blend the mixture for about 15 minutes. Thereafter, add in 125 milliliters of acetone, and then blend the mixture for about 15 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner. This composition can also be used for making tail fires for rockets and the like, and may be used in cones if desired.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30.61% potassium perchlorate, 30.61% lampblack, 25.51% charcoal, 5.1% shellac, 5.1% dextrin, 3.06% potassium nitrate, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in tail fires, and for aerial devices.

07-03-005B: "Willow" star composition for multiple purposes (lampblack special):
Into a suitable ball mill, filled with 100 grams of Teflon coated steel shot, place ***360 grams of finely powdered lampblack***, followed by ***30 grams of dextrin***, and then tumble the mixture on moderate RPM for about 30 minutes. Thereafter, into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place the tumbled mixture obtained previously, and then add in ***240 grams of potassium chlorate,*** and then followed by ***30 grams of potassium nitrate.*** Now, add in 100 milliliters of water, and then blend the mixture for about 15 minutes. Thereafter, add in 100 milliliters of acetone, and then blend the mixture for about 15 minutes to form a uniform dough. Note: decant-off any liquid layers if they exist. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner. This composition can also be used for making tail fires for rockets and the like, and may be used in cones if desired.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54.54% lampblack, 36.36% potassium chlorate, 4.54% dextrin, 4.54% potassium nitrate, 0.02% impurities balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in tail fires, and for aerial devices.

07-03-006A: Beautiful Silver shower star composition for multiple purposes:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot, place ***160 grams of finely powdered soft wood charcoal***, followed by ***200 grams of dextrin***, followed by ***140 grams of flours of sulfur***, and then followed by ***40 grams of powdered boric acid***, and then tumble the mixture on moderate RPM for about 30 minutes. Thereafter, into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place the tumbled mixture obtained previously, and then add in ***700 grams of potassium nitrate,*** followed by ***1200 grams of potassium perchlorate***, followed by ***400 grams of atomized aluminum*** of 0.1 mm, followed by ***500 grams of aluminum bronze***, and then followed by ***300 grams of coarse flake aluminum.*** Now, add in 450 milliliters of 95% ethyl alcohol, and then blend the mixture for about 45 minutes to form a rough dough or pasty mass. Note: after blending, if the material is two "wet", allow it to dry until a nice dough like material is obtained (be sure to blend the mixture periodically during the drying process). Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star(s), and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner. This composition can also be used for making tail fires for rockets and the like, and may be used in cones if desired.
Burn rate: Smooth, but choppy.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.

Percentage: ***32.96% potassium perchlorate, 19.23% potassium nitrate, 13.73% aluminum bronze, 10.98% atomized aluminum, 8.24% flake aluminum, 5.49% dextrin, 4.39% soft wood charcoal, 3.84% sulfur, 1.09% boric acid, 0.05% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in tail fires, and for aerial devices.

07-03-006B: Beautiful Silver shower star composition for multiple purposes (reduced component):
Into a suitable beaker or similar container, place 350 milliliters of 95% ethyl alcohol, and then add in ***360 grams of shellac***. Thereafter, heat the mixture at about 60 Celsius with stirring for about 5 minutes. Thereafter, remove the heat source, and then add in ***1300 grams of ammonium perchlorate***, followed by ***440 grams of aluminum flake***. Thereafter, blend the mixture for about 50 minutes. During this time the temperature of the mixture will lower to ambient. Thereafter, add in 250 milliliters of ice-cold water, followed by 50 milliliters of ethyl acetate, and the blend the mixture for another 15 minutes. Now, decant-off any liquid layers, and then place the wet material onto a shallow pan or tray, and allow it to dry to a fine dough like material. Note: remember to blend the mixture periodically during the drying process. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll onto existing stars forming an outer layer, or press the mixture into any desirable container, tube, ect., under pressure. The composition should be cured in an oven at normal temperature in the usual manner. This star composition should be primed with a perchlorate strobe star composition. This composition can also be used for making tail fires for rockets and the like, and may be used in cones if desired.
Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.9% ammonium perchlorate, 20.95% aluminum flake, 17.14% shellac, 0.01% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in tail fires, and for aerial devices.

07-03-006C: Beautiful Silver shower star composition for multiple purposes (modified):
Into a suitable ball mill, filled with 250 grams of heavy Teflon coated steel shot, place ***40 grams of boric acid***, followed by ***200 grams of fine-grained soft wood charcoal***, and then followed by ***100 grams of dextrin***. Now, add in 75 milliliters of hexane, and then tumble the mixture at 300 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl or similar container, equipped with motorized stirrer, and then add in ***1100 grams of potassium nitrate,*** and then followed by ***300 grams of "flitter" aluminum*** commercial product. Thereafter, add in 300 milliliters of hexane, and then blend the mixture for about 30 to 40 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll onto existing stars forming an outer layer, or press the mixture into any desirable container, tube, ect., under pressure. The composition should be cured in an oven at normal temperature in the usual manner. This star composition should be primed with a perchlorate strobe star composition. This composition can also be used for making tail fires for rockets and the like, and may be used in cones if desired.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63.21% potassium nitrate, 17.24% flitter aluminum, 11.49% wood charcoal, 5.74% dextrin, 2.29% boric acid, 0.03% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in tail fires, and for aerial devices.

07-03-007A: "Electric" star composition for multiple purposes:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***40 grams of fine aluminum powder***, followed by ***80 grams of medium coarse aluminum***, followed by ***40 grams of black powder***, followed by ***60 grams of antimony sulfide***, and then followed by ***80 grams of flours of sulfur***. Thereafter, add in 100 milliliters of acetone, and then blend the mixture for about 30 minutes on moderate speed. Thereafter, add in ***240 grams of potassium nitrate***, and then continue to blend the mixture on moderate speed for about 30 minutes to form a rough dough-like material. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over an existing star to form a second layer. Note: the stars should then be cured in an oven at moderate temperature in the usual manner. The composition can be sieved through any desired mesh screen, and used as is, or pressed into tablets, rods, or pellets of any desired size. Priming may or may not be needed.
Burn rate: Average.

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44.44% potassium nitrate, 14.81% sulfur, 14.81% coarse aluminum, 11.11% antimony sulfide, 7.4% aluminum powder, 7.4% black powder, 0.03% residues***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets, but can also be used in cones, fountains, and the like.

07-03-007B: "Electric" star composition for multiple purposes:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***180 grams of fine aluminum powder***, followed by ***80 grams of medium coarse aluminum***, followed by ***60 grams of coarse aluminum***, followed by ***100 grams of dextrin***, and then followed by ***40 grams of flours of sulfur***. Thereafter, add in 300 milliliters of 95% ethyl alcohol, and then blend the mixture for about 30 minutes on moderate speed. Thereafter, add in ***100 grams of barium nitrate***, and then followed by ***1200 grams of potassium chlorate***, and then continue to blend the mixture on moderate speed for about 30 minutes to form a rough dough-like material. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over an existing star to form a second layer. Note: the stars should then be cured in an oven at moderate temperature in the usual manner. The composition can be sieved through any desired mesh screen, and used as is, or pressed into tablets, rods, or pellets of any desired size. Priming may or may not be needed.
Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***68.18% potassium chlorate, 10.22% aluminum, 5.68% dextrin, 5.68% barium nitrate, 4.54% medium coarse aluminum, 3.4% coarse aluminum, 2.27% flours of sulfur, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets, but can also be used in cones, fountains, and the like.

07-03-007C: "Electric" star composition for multiple purposes:
Into a suitable ball mill, filled 200 grams of heavy Teflon coated steel shot, place ***50 grams of dextrin***, followed by ***1000 grams of aluminum powder*** of average mesh, and then followed by 175 milliliters of ether. Thereafter, tumble the mixture at 100 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, or similar container, equipped with motorized stirrer, and then add in 350 milliliters of more ether, followed by ***50 grams of barium nitrate***, and then followed by ***300 grams of potassium perchlorate***, and then continue to blend the mixture on moderate speed for about 30 to 45 minutes to form a rough dough-like material. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over an existing star to form a second layer. Note: the stars should then be cured in an oven at moderate temperature in the usual manner. The composition can be sieved through any desired mesh screen, and used as is, or pressed into tablets, rods, or pellets of any desired size. Priming may or may not be needed.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 6+ (when primed)
Tendency to cake: None.
Explosive ability: None.
Percentage: ***71.42% aluminum powder, 21.42% potassium perchlorate, 3.57% dextrin, 3.57% barium nitrate, 0.02% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets, but can also be used in cones, fountains, and the like.

07-03-007D: "Electric" star composition for multiple purposes (reduced component):
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, add in 75 milliliters of 99% isopropyl alcohol, followed by ***50 grams of dextrin***, and then followed by ***100 grams of medium coarse aluminum***, and then continue to blend the mixture on moderate speed for about 15 minutes. Thereafter, add in ***200 grams of potassium perchlorate***, and then continue to blend the mixture for about 30 to 45 minutes to form a rough dough-like material. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over an existing star to form a second layer. Note: the stars should then be cured in an oven at moderate temperature in the usual manner. The composition can be sieved through any desired mesh screen, and used as is, or pressed into tablets, rods, or pellets of any desired size. Priming may or may not be needed.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***57.14% potassium perchlorate, 28.57% medium coarse aluminum, 14.28% dextrin, 0.01% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets, but can also be used in cones, fountains, and the like.

07-03-008A: "FireFly" star composition for multiple purposes:
Into a suitable empty ball mill, place ***290 grams of air floated charcoal***, followed by ***60 grams of flours of sulfur***, followed by ***105 grams of 80 mesh charcoal***, and then gently tumble the mixture at 50 RPM for about 3 hours. Thereafter, place this tumble mixture into a suitable mixing bowl, or similar container, equipped with motorized stirrer, and then add in ***500 grams of potassium nitrate***, followed by ***45 grams of large flaked aluminum***, and then followed by ***50 grams of dextrin***. Thereafter, add in 75 milliliters of acetone, and then blend the mixture on moderate speed for about 40 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material onto existing stars to form a second coating, and then cure the stars in an oven at moderate temperature until dry and hard. The mixture can also be used in the form of a loose powder, or grains of any desired sieve size for any desired purpose (mainly for making brilliant fire trails).
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47.61% potassium nitrate, 27.61% air floated charcoal, 10% 80-mesh charcoal, 5.71% sulfur, 4.76% dextrin, 4.28% large flaked aluminum, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets (for producing brilliant fire trails), but can also be used in cones, fountains, and for other purposes.

07-03-008B: "FireFly" star composition for multiple purposes (modified for use as a rocket propellant):
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***94 grams of flours of sulfur***, followed by ***660 grams of air floated charcoal***, and then followed by ***116 grams of antimony trisulfide***. Thereafter, add in 200 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 15 minutes. Now, into a separate mixing bowl, equipped with motorized stirrer, place ***84 grams of 12 micron spherical aluminum***, followed by ***940 grams of potassium nitrate***, and then followed by ***104 grams of dextrin***. Thereafter, add in 300 milliliters of acetone, and the blend the mixture on moderate speed for about 15 minutes. Thereafter, once both mixtures have been blended, add both mixtures to a third, clean mixing bowl, equipped with another motorized stirrer, and then blend the combined mixture for about 40 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material onto existing stars to form a second coating, and then cure the stars in an oven at moderate temperature until dry and hard. The mixture can also be used as a rocket propellant for small and moderate sized rockets (will produce a brilliant fire trail). The mixture can also be used in the form of a loose powder, or grains of any desired sieve size for any desired purpose (mainly for making brilliant fire trails).
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47.04% potassium nitrate, 33.03% air floated charcoal, 5.8% antimony trisulfide, 5.2% dextrin, 4.7% sulfur, 4.2% spherical aluminum, 0.03% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets (for producing brilliant fire trails), but can also be used in cones, fountains, and for other purposes.

07-03-008C: "FireFly" star composition for multiple purposes (producing brilliant fire trails with secondary sparkle effect):
Into a suitable ball mill, filled with 200 grams of heavy Teflon coated steel shot, place ***490 grams of potassium nitrate***, and then tumble the nitrate at 100 RPM for about 1 hour. In the meantime, into a separate empty ball mill, place ***290 grams of air floated charcoal***, followed by ***110 grams of 30+ mesh charcoal***, followed by ***90 grams of flours of sulfur***, and then followed by ***100 grams of dextrin***, and then tumble the mixture at 300 RPM for about 1 hour. After tumbling both mixtures, place both mixtures into a suitable mixing bowl, or similar container, equipped with motorized stirrer, and then add in 250 milliliters of acetone, and then followed by ***50 grams of medium coarse aluminum***, and then blend the combined mixture on moderate speed for about 1 hour to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material onto existing stars to form a second coating, and then cure the stars in an oven at moderate temperature until dry and hard. The mixture can also be used as a rocket propellant for small and moderate sized rockets (will produce a brilliant fire trail). The mixture can also be used in the form of a loose powder, or grains of any desired sieve size for any desired purpose (mainly for making brilliant fire trails).
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.36% potassium nitrate, 25.66% air floated charcoal, 9.73% charcoal powder, 8.84% dextrin, 7.96% sulfur, 4.42% medium coarse aluminum, 0.03% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets (for producing brilliant fire trails), but can also be used in cones, fountains, and for other purposes.

07-03-009A: "Glitter" star composition for multiple purposes:
In typical fashion, in a suitable mixing bowl, drum, or similar container, place ***550 grams of potassium nitrate***, followed by 200 milliliters of 95% ethyl alcohol, and then followed by 75 milliliters of ice water. Now, immediately add in ***100 grams of finely powdered lampblack***, followed by ***100 grams of flours of sulfur***, followed by ***50 grams of 200 to 400 mesh aluminum***, followed by ***40 grams of dextrin***, and then finally followed by ***160 grams of antimony trisulfide***. Thereafter, blend the mixture on moderate speed until a uniform dough is obtained. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars, or rolled onto other stars to form an outer coating, and then cured in an oven at ordinary temperatures. This composition can also be used as a loose powder (once dried), or used in any desired propose to achieve a brilliant glitter like effect.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55% potassium nitrate, 16% antimony trisulfide, 10% sulfur, 10% lampblack, 5% aluminum, 4% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets (for producing brilliant glittering effects), but can also be used in cones, fountains, and for other purposes.

07-03-010A: "Beautiful "Red Pill" star composition for multiple purposes:
Into a suitable empty ball, place ***260 grams of red gum***, followed by ***380 grams of strontium carbonate***, and then followed by 75 milliliters of acetone. Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, into a clean empty mixing bowl or similar container, equipped with motorized stirrer, place 275 milliliters of acetone, and then add in ***80 grams of dextrin***, and then blend the mixture for about 10 minutes. Thereafter, add in ***1280 grams of potassium chlorate***, and then add in the tumble mixture prepared previous. Thereafter, blend the mixture on moderate speed for about 1 hour or until a nice dough-like mixture is obtained. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll over any previous stars to form a second layer, and then cure the stars in an oven at moderate temperature in the usual manner. This composition can also be used as a loose powder or grains of any size as desired for use in multi-purposes.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.

Explosive ability: None.
Percentage: ***64% potassium chlorate, 19% strontium carbonate, 13% red gum, 4% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Can be used for multiple purposes.

07-03-011A: Simplified sparkler star composition for multiple purposes:
Into a typical mixing drum, or bowl, equipped with motorized stirrer, place ***300 grams of dextrin***, followed by ***900 grams of coarse aluminum***, and then followed by ***1800 grams of potassium perchlorate***. Thereafter, add in 350 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 50 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the mixture onto existing stars to form a second layer, and then cure the stars in an oven at moderate temperature in the usual manner. The mixture can also be used a loose powder or grains of any desired mesh, or the dough like material can be pressed into rods, pellets, ect., under pressure in the usual manner. The composition may or may not need to be primed.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: Stable. If the aluminum is not coarse, and is too fine, the mixture will flash when ignited.
Percentage: ***60% potassium perchlorate, 30% coarse aluminum, 10% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Can be used for multiple purposes.

07-03-012A: "White flitter" star composition for multiple purposes:
Into a suitable mixing bowl, or any similar container, equipped with motorized stirrer, place 250 milliliters of 95% ethyl alcohol, and then add in ***50 grams of dextrin***, followed by ***500 grams of fine aluminum flake***, followed by ***150 grams of powdered soft wood charcoal***, followed by ***150 grams of flours of sulfur***, and then followed by ***200 grams of coarse aluminum***. Thereafter, blend the mixture on moderate speed for about 30 minutes. In the meantime, into an empty ball mill, place ***850 grams of potassium nitrate***, and then tumble the nitrate at 300 RPM for about 15 minutes. After blending the previous mixture for about 30 minutes, add in the tumbled nitrate, and then blend the combined mixture for about 45 minutes on high speed. Note: more alcohol can be added if desired. Once the blending has gone on for about 45 minutes, the mixture is ready for use. To use, simply roll the doughy-like material into stars of any desired diameter, or roll the material onto existing stars to form a second layer, and then cure in an oven in the usual manner. The material can also be used as a dry powder, or of any desired grain size, or the mixture can be pressed into molds, rods, or pellets of any desired shape for any desired use.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***44.73% potassium nitrate, 26.31% fine aluminum flake, 10.52% coarse aluminum, 7.89% soft wood charcoal, 7.89% sulfur, 2.63% dextrin, 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Can be used for multiple purposes.

07-03-013A: "White comet" star composition for multiple purposes:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, of the usual diameter, place ***960 grams of potassium nitrate***, followed by ***150 grams of powdered sulfur***, and then followed by ***440 grams of finely powdered soft wood charcoal***. Thereafter, add in 75 milliliters of water, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, or any similar container, equipped with motorized stirrer, and then add in 300 milliliters of acetone. Thereafter, add in ***100 grams of dextrin***, and then blend the entire mixture on high speed for about 40 to 50 minutes, or until a fine dough like material obtained. Note: more solvent may be added if the mixture is too dry. Once a dough-like material has been obtained, the mixture is ready for use. To use, simply roll the doughy-like material into stars of any desired diameter, or roll the material onto existing stars to form a second layer, and then cure in an oven in the usual manner. The material can also be used as a dry powder, or of any desired grain size, or the mixture can be pressed into molds, rods, or pellets of any desired shape for any desired use.
Burn rate: Average.
Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5 ½

Ease of ignition (1 to 10): 5 ¾

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***58.18% potassium nitrate, 26.66% soft wood charcoal, 9.09% sulfur, 6.06% dextrin, 0.01% balance***

Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Can be used for multiple purposes.

07-03-013B: "White comet" star composition for multiple purposes (modified composition):

Into a suitable ball mill, filled with 300 grams of Teflon coated steel shot, of the usual diameter, place ***400 grams of potassium nitrate***, followed by ***240 grams of finely powdered hard wood charcoal***. Thereafter, add in 125 milliliters of water, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, or any similar container, equipped with motorized stirrer, and then add in 150 milliliters of acetone. Thereafter, add in ***90 grams of dextrin***, and then followed by ***80 grams of finely powdered sulfur***, and then blend the entire mixture on high speed for about 30 minutes, or until a fine dough like material obtained. Note: more solvent may be added if the mixture is too dry. Once a dough-like material has been obtained, the mixture is ready for use. To use, simply roll the doughy-like material into stars of any desired diameter, or roll the material onto existing stars to form a second layer, and then cure in an oven in the usual manner. The material can also be used as a dry powder, or of any desired grain size, or the mixture can be pressed into molds, rods, or pellets of any desired shape for any desired use.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5+

Ease of ignition (1 to 10): 5+

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***49.38% potassium nitrate, 29.62% hard wood charcoal, 11.11% dextrin, 9.87% sulfur, 0.02% balance***

Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Can be used for multiple purposes.

07-03-014A: Classic "Dragon eggs" crackling star composition:

Into a suitable mixing bowl, or similar container, equipped with a motorized stirrer, in the usual manner, place 300 milliliters of hexane, and then add in ***100 grams of nitrocellulose*** (average nitrogen content), and then blend the mixture for about 15 minutes. Thereafter, add in ***91 grams of copper-II-oxide***, followed by ***91 grams of magnalium 50/50 alloy***, and then followed by ***818 grams of lead tetraoxide*** (Pb3O4). Thereafter, blend the mixture on moderate speed for about 45 minutes. Note: the material should resemble a dough-like mass—more solvent may or may not be added. After the blending process, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material over existing stars to form a second coating and the cure them in an oven under normal temperature until their dry and hard. These stars don't have to be primed

Burn rate: Very rapid.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9+

Ease of ignition (1 to 10): 9+

Tendency to cake: None.

Explosive ability: Explodes shortly after ignition.

Percentage: ***74.36% lead tetraoxide, 9.09% nitrocellulose, 8.27% copper-II-oxide, 8.27% magnalium alloy, 0.01% impurities***

Classification: Deflagrating explosive (classified as explosive).

Use: Widely used composition for producing crackling effects in aerial fireworks.

07-03-014B: Classic "Dragon eggs" crackling star composition (modified with bismuth trioxide):

This procedure is identical accept the lead tetraoxide is replaced with bismuth trioxide. Into a suitable mixing bowl, or similar container, equipped with a motorized stirrer, in the usual manner, place 300 milliliters of hexane, and then add in ***100 grams of nitrocellulose*** (average nitrogen content), and then blend the mixture for about 15 minutes. Thereafter, add in ***91 grams of copper-II-oxide***, followed by ***91 grams of magnalium 50/50 alloy***, and then followed by ***818 grams of bismuth trioxide*** (Bi2O3). Thereafter, blend the mixture on moderate speed for about 45 minutes. Note: the material should resemble a dough-like mass—more solvent may or may not be needed. After the blending process, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material over existing stars to form a second coating and then cure them in an oven under normal temperature until their dry and hard. These stars don't have to be primed.

Burn rate: Very rapid.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 9+

Ease of ignition (1 to 10): 9+

Tendency to cake: None.

Explosive ability: Explodes shortly after ignition.

Percentage: ***74.36% bismuth trioxide, 9.09% nitrocellulose, 8.27% copper-II-oxide, 8.27% magnalium alloy, 0.01% impurities***

Classification: Deflagrating explosive (classified as explosive).

Use: Widely used composition for producing crackling effects in aerials fireworks.

07-03-015A: Brilliant blue star with fiery trail:

Into a suitable ball mill, filled with 150 grams of heavy Teflon coated steel shot, place ***700 grams of ammonium perchlorate***, and then tumble the mixture at 150 RPM for about 30 minutes. Thereafter, place this tumbled perchlorate into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***100 grams of copper carbonate***, followed by ***100 grams of red gum***, followed by ***50 grams of dextrin***, and then followed by ***100 grams of fine grained soft wood charcoal***, and then add in 300 milliliters of 99% isopropyl alcohol. Thereafter, blend the mixture on moderate speed for about 30 minutes to form a dough-like material. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll the mixture onto existing stars to form a second coating, and then cure the mixture in an oven at ordinary temperature in the usual means. The mixture should be primed with a perchlorate priming composition.

Burn rate: Typical.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5+

Ease of ignition (1 to 10): 5 ½

Tendency to cake: None.

Explosive ability: Stable.

Percentage: ***66.66% ammonium perchlorate, 9.52% copper carbonate, 9.52% red gum, 9.52% soft wood charcoal, 4.76% dextrin, 0.02% residual balance***

Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Used for making interesting blue star effects with trail.

07-03-016A: Brilliant "electric" purple star:

Into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***680 grams of potassium perchlorate***, and then tumble the mixture at 100 RPM for about 30 minutes. Thereafter, place this tumbled perchlorate into a suitable mixing bowl, equipped with motorized stirrer, and then add in ***50 grams of dextrin***, followed by ***50 grams of magnalium 50/50 alloy***, followed by ***70 grams of hexamine***, followed by ***80 grams of copper-II-benzoate***, and then followed by ***120 grams of strontium carbonate***, and then add in 250 milliliters of hexane. Thereafter, blend the mixture on moderate speed for about 30 minutes to form a dough-like material. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll the mixture onto existing stars to form a second coating, and then cure the mixture in an oven at ordinary temperature in the usual means. The mixture should be primed with a perchlorate priming composition.

Burn rate: Typical.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: Stable. May explode under severe conditions.

Percentage: ***64.76% potassium perchlorate, 11.42% strontium carbonate, 7.61% copper-II-carbonate, 6.66% hexamine, 4.76% dextrin, 4.76% magnalium 50/50 alloy, 0.03% mixed balance***

Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Used for making interesting electric purple stars for multiple uses.

07-03-017A: Brilliant "flash" composition for stars:

Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***120 grams of glutinous rice starch***, followed by ***20 grams of finely powdered boric acid***, and then followed by ***540 grams of fine aluminum flake***. Now, add in 200 milliliters of acetone, and then blend the mixture for about 15 minutes. Thereafter, add in ***1320 grams of barium nitrate***, and then add in 250 milliliters of ice water, and then continue to blend the mixture for about 30 minutes. Note: pour off any liquid if it exists. Thereafter the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, and then cure the stars in an oven at moderate temperature in the usual manner. Thereafter, roll any other desired star composition over the cured stars to form an outer layer of any desired diameter. The mixture can be used in loose form if desired for use in propulsion.

Burn rate: Rapid.

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Stable. May explode under certain circumstances.
Percentage: ***66% barium nitrate, 27% aluminum flake, 6% glutinous rice starch, 1% boric acid***
Classification: Deflagrating explosive (classified as explosive).
Use: Widely used composition for producing flashes.

07-03-017B: Brilliant "flash" composition for with silver effect:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot of the usual diameter, place ***60 grams of lampblack***, followed by ***150 grams of glutinous rice starch***, followed by ***150 grams of standard commercially available rosin***, and then tumble the mixture for about 30 minutes at 300 RPM. Thereafter, remove the tumbled mixture from the ball mill, and separate the mixture from the steel shot using any desired screen, in the usual manner. Thereafter, place this tumbled mixture into a suitable mixing bowl, or similar container, equipped with motorized stirrer, and then add in ***1680 grams of potassium perchlorate***, and then followed by ***960 grams of fine aluminum flake.*** Thereafter, add in 500 milliliters of ether, and then blend the mixture for about 30 to 45 minutes. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, and then cure the stars in an oven at moderate temperature in the usual manner. Thereafter, roll any other desired star composition over the cured stars to form an outer layer of any desired diameter. The mixture can be used in loose form if desired for use in propulsion.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 8+ (depends on hardness of final product after curing).
Tendency to cake: None.
Explosive ability: Stable. May explode under certain circumstances.
Percentage: ***56% potassium perchlorate, 32% aluminum flake, 5% rice starch, 5% rosin, 2% lampblack***
Classification: Deflagrating explosive (classified as explosive).
Use: Widely used composition for producing flashes with a silver effect.

07-03-018A: Brilliant "silver wave" star composition with silver tail:
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place 300 milliliters of ethyl acetate, and then add in ***500 grams of potassium perchlorate***, followed by ***500 grams of coarse aluminum***, and then followed by ***50 grams of glutinous rice starch***. Thereafter, blend the mixture on moderate speed for about 30 to 40 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the mixture onto existing stars to form a second layer of any desired thickness, and then cure the stars in an oven at moderate temperature in the usual manner. Priming may or may not be needed.
Burn rate: N/A
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A.
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47.61% potassium perchlorate, 47.61% coarse aluminum, 4.76% rice starch, 0.02% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create spectacular looking tail effects.

07-03-019A: Beautiful "golden wave" star composition with gold tail:
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place 350 milliliters of hexane, and then add in ***740 grams of potassium nitrate***, followed by ***940 grams of coarse aluminum***, followed by ***120 grams of glutinous rice starch***, followed by ***180 grams of antimony trisulfide***, and then followed by ***20 grams of boric acid***. Thereafter, blend the mixture on moderate speed for about 30 to 40 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the mixture onto existing stars to form a second layer of any desired thickness, and then cure the stars in an oven at moderate temperature in the usual manner. Priming may or may not be needed.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5

Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47% coarse aluminum, 37% potassium nitrate, 9% antimony trisulfide, 6% glutinous rice starch, 1% boric acid***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create spectacular golden light effects.

07-03-019B: Beautiful "golden wave" star composition with gold tail (sulfur based):
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place 350 milliliters of 95% ethyl alcohol, and then add in ***740 grams of potassium nitrate***, followed by ***940 grams of coarse aluminum flake***, followed by ***120 grams of glutinous rice starch***, followed by ***180 grams of finely powdered sulfur***, and then followed by ***20 grams of boric acid.*** Thereafter, blend the mixture on moderate speed for about 30 to 40 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the mixture onto existing stars to form a second layer of any desired thickness, and the cure the stars in an oven at moderate temperature in the usual manner. Priming may or may not be needed.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47% coarse aluminum, 37% potassium nitrate, 9% sulfur, 6% glutinous rice starch, 1% boric acid***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create spectacular golden light effects.

07-03-020A: Beautiful "Chrysanthemum" star composition:
Into a suitable ball mill, filled with 250 grams of heavy Teflon coated steel shot, place ***140 grams of glutinous rice starch***, followed by ***800 grams of potassium nitrate***, and then followed by ***20 grams of boric acid***, and then tumble the mixture at 200 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing drum, or bowl, equipped with motorized stirrer, and then add in 400 milliliters of hexane. Thereafter, add in ***600 grams of coarse flake aluminum***, followed by ***200 grams of flours of sulfur***, followed by ***200 grams of powdered realgar mineral***, and then finally followed by ***20 grams of hemp coal***. Thereafter, blend the mixture on high speed for about 1 hour to form a uniform mixture. Once a uniform mixture is obtained, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll the mixture onto existing stars to form a second coating, and then cure the mixture in an oven in the usual manner. If desired, the mixture can be pressed into pellets, rods, or any desired shape for any desired purpose. Priming should be of the perchlorate type.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***40.40% potassium nitrate, 30.30% flake aluminum, 10.10% sulfur, 10.10% realgar mineral, 7.07% glutinous rice starch, 1.01% boric acid, 1.01% hemp coal, 0.01% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful yellow fire dust effects.

07-03-021A: Beautiful "charcoal" fire dust star composition producing a reddish effect:
Into a suitable mixing bowl, equipped with motorized stirrer, place 750 milliliters of acetone, and then add in ***1100 grams of potassium nitrate***, and then followed by ***660 grams of willow charcoal.*** Thereafter, blend the mixture on high speed for about 2 hours. Thereafter, place the mixture in a warm place, or use a vacuum to allow the bulk of the solvent to evaporate. Once the bulk of the acetone has been removed, place the mixture back into the previous mixing bowl, or a clean one, equipped with motorized stirrer in the usual manner, and then add in ***140 grams of finely powdered sulfur***, and then followed by ***100 grams of glutinous rice starch.*** Thereafter, add in 250 milliliters of hexane, and then blend the mixture on moderate speed for about 30 minutes to form a dough. Note: more hexane may need to be added to form a good dough. Once a dough-like material has been achieved, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be used for multiple purposes.
Burn rate: Moderate.
Water resistance: Good.

Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***55% potassium nitrate, 33% willow charcoal, 7% sulfur, 5% rice starch***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful fire dust effects.

07-03-021B: Beautiful "charcoal" fire dust star composition producing a reddish effect (modified):
Into a suitable mixing bowl, equipped with motorized stirrer, place 700 milliliters of acetone, and then add in ***980 grams of potassium nitrate***, and then followed by ***800 grams of willow charcoal***. Thereafter, blend the mixture on high speed for about 2 hours. Thereafter, place the mixture in a warm place, or use a vacuum to allow the bulk of the solvent to evaporate. Once the bulk of the acetone has been removed, place the mixture back into the previous mixing bowl, or a clean one, equipped with motorized stirrer in the usual manner, and then add in ***120 grams of finely powdered sulfur***, and then followed by ***100 grams of glutinous rice starch***. Thereafter, add in 275 milliliters of hexane, and then blend the mixture on moderate speed for about 30 minutes to form a dough. Note: more hexane may need to be added to form a good dough. Once a dough-like material has been achieved, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be used for multiple purposes.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***49% potassium nitrate, 40% willow charcoal, 6% sulfur, 5% rice starch***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful fire dust effects.

07-03-021C: Beautiful "charcoal" fire dust star composition producing a reddish effect (modified 2):
Into a suitable mixing bowl, equipped with motorized stirrer, place 800 milliliters of acetone, and then add in ***880 grams of potassium nitrate***, and then followed by ***880 grams of willow charcoal***. Thereafter, blend the mixture on high speed for about 2 hours. Thereafter, place the mixture in a warm place, or use a vacuum to allow the bulk of the solvent to evaporate. Once the bulk of the acetone has been removed, place the mixture back into the previous mixing bowl, or a clean one, equipped with motorized stirrer in the usual manner, and then add in ***120 grams of finely powdered sulfur***, and then followed by ***120 grams of glutinous rice starch***. Thereafter, add in 250 milliliters of hexane, and then blend the mixture on moderate speed for about 30 minutes to form a dough. Note: more hexane may need to be added to form a good dough. Once a dough-like material has been achieved, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be used for multiple purposes.
Burn rate: Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***44% potassium nitrate, 44% willow charcoal, 6% sulfur, 6% rice starch***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful fire dust effects.

07-03-022A: Gorgeous "silver wave chrysanthemum" fire dust star producing a reddish/yellow/green twinkling effect:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***500 grams of potassium nitrate***, followed by ***75 grams of soft pine wood charcoal***, and then followed by ***175 grams of highly pure powdered sulfur***. Thereafter, add in 125 milliliters of ice water, and then tumble the mixture at 150 to 200 RPM for about 3 hours. Now, after 3 hours of tumbling, remove the mixture, in the usual manner, and then place it into a suitable mixing bowl, equipped with motorized stirrer, and then add in 450 milliliters of 95% ethyl alcohol, followed by ***60 grams of glutinous rice starch***, followed by ***25 grams of antimony trisulfide***, followed by ***75 grams of realgar mineral (powdered)***, followed by ***15 grams of magnalium 50/50 alloy*** (powdered), and then followed by ***75 grams of coarse aluminum flake***, and then blend the mixture on high speed for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be used for multiple purposes.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50% potassium nitrate, 17.5% sulfur, 7.5% realgar, 7.5% wood charcoal, 7.5% coarse aluminum flake, 6% glutinous rice starch, 2.5% antimony trisulfide, 1.5% magnalium 50/50 alloy***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create brilliant color effects.

07-03-023A: Metal fire dust star composition:
Into a suitable ball mill, filled with 350 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***760 grams of potassium nitrate***, followed by ***200 grams of soft wood charcoal***, and then followed by ***260 grams of highly pure powdered sulfur***. Thereafter, add in 175 milliliters of ice water, and then tumble the mixture at 150 to 200 RPM for about 3 hours. Now, after 3 hours of tumbling, remove the mixture, in the usual manner, and then place it into a suitable mixing bowl, equipped with motorized stirrer, and then add in 400 milliliters of 95% ethyl alcohol, followed by ***100 grams of dextrin***, followed by ***280 grams of barium nitrate***, followed by ***160 grams of finely powdered iron-III-oxide***, and then followed by ***240 grams of atomized aluminum.*** Thereafter, blend the mixture on high speed for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be pressed into tubes, fountains, cones, ect., in the usual manner if desired. Priming may or may not be needed.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***38% potassium nitrate, 14% barium nitrate, 13% sulfur, 12% atomized aluminum, 10% wood charcoal, 8% iron-III-oxide, 5% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create brilliant glitter effects in fireworks.

07-03-023B: Metal fire dust star composition (modified):
Into a suitable ball mill, filled with 450 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***860 grams of potassium nitrate***, followed by ***200 grams of soft wood charcoal***, and then followed by ***260 grams of highly pure powdered sulfur***. Thereafter, add in 175 milliliters of ice water, and then tumble the mixture at 150 to 200 RPM for about 3 hours. Now, after 3 hours of tumbling, remove the mixture, in the usual manner, and then place it into a suitable mixing bowl, equipped with motorized stirrer, and then add in 350 milliliters of 95% ethyl alcohol, followed by ***80 grams of dextrin***, followed by ***260 grams of barium nitrate***, followed by ***140 grams of finely powdered iron-III-oxide,*** and then followed by ***260 grams of atomized aluminum.*** Thereafter, blend the mixture on high speed for about 1 hour to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be pressed into tubes, fountains, cones, ect., in the usual manner if desired. Priming may or may not be needed.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***41.74% potassium nitrate, 12.62% barium nitrate, 12.62% sulfur, 12.62% atomized aluminum, 9.7% wood charcoal, 6.79% iron-III-oxide, 3.88% dextrin, 0.03% mixed residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Used to create brilliant glitter effects in fireworks.

07-03-023C: Metal fire dust star composition (modified 2):

Into a suitable ball mill, filled with 300 grams of mixed Teflon coated steel shot of ranging from 5 to 10 millimeters in diameter, place ***800 grams of potassium nitrate***, followed by ***240 grams of soft wood charcoal***, and then followed by ***240 grams of highly pure powdered sulfur***. Thereafter, add in 175 milliliters of ice water, and then tumble the mixture at 175 to 200 RPM for about 3 hours. Now, after 3 hours of tumbling, remove the mixture, in the usual manner, and then place it into a suitable mixing bowl, equipped with motorized stirrer, and then add in 350 milliliters of 95% ethyl alcohol, followed by ***80 grams of dextrin***, followed by ***260 grams of barium nitrate***, followed by ***140 grams of finely powdered iron-III-oxide,*** and then followed by ***240 grams of atomized aluminum.*** Thereafter, blend the mixture on high speed for about 1 hour to form a uniform mixture in the usual manner. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be pressed into tubes, fountains, cones, ect., in the usual manner if desired. Priming may or may not be needed.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***40% potassium nitrate, 13% barium nitrate, 12% sulfur, 12% atomized aluminum, 12% wood charcoal, 7% iron-III-oxide, 4% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create brilliant glitter effects in fireworks.

07-03-024A: Brilliant comet composition for combination use:

Into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***200 grams of exfoliated mica***, and then tumble the mixture at 500 RPM for about 3 hours to pulverize it. Thereafter, sieve this tumbled mica through an 80 to 100-mesh screen. Thereafter, place this mica into a suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of acetone, and then add in ***120 grams of bentonite clay***, followed by ***20 grams of guar gum***, followed by ***200 grams of barium carbonate***, followed by ***460 grams of barium benzoate***, and then followed by ***1000 grams of potassium chlorate***, and then blend the mixture vigorously for about 2 hours. Note: more acetone will probably need to be added during the mixing process to makeup for lost solvent due to evaporation. Thereafter, blend the mixture to form a uniform dough. Now, once a uniform mixed material is obtained, the material should be manually blended with other preformed and cured stars from other procedures. Note: the object is to embed other preformed cured stars in the comet mixture. The mass of the comet mixture should be 10 to 75 millimeters in diameter, and the embedded stars can range from 2 to 10 millimeters in diameter. Once the desired preformed cured stars have been embedded into the original mixture, the entire mass should then be cured in an oven at moderate temperature so the original comet mixture can harden. The exact effect of the cured stars will depend on how many embedded stars you use and to what size they are, and to what color effects they produce. You can experiment with different stars and different sizes and different ratios to get a whole arsenal of different effects. All the stars (including the embedded ones) should be coated with a thin coating of priming mixture in the usual manner for proper ignition and burn.

Burn rate: Typical for star compositions.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: (Commit mixture): ***50% potassium chlorate, 23% barium benzoate, 10% barium carbonate, 10% exfoliated mica, 6% bentonite clay, 1% guar gum***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create brilliant combination effects.

07-03-024B: Brilliant comet composition for combination use (containing zirconium silicate substitute):

Into a suitable mixing bowl, equipped with motorized stirrer, add in 350 milliliters of 95% ethyl alcohol, and then add in ***200 grams of bentonite clay***, followed by ***20 grams of guar gum***, followed by ***600 grams of zirconium silicate***, followed by ***180 grams of barium carbonate***, and then followed by ***1000 grams of potassium chlorate***, and then blend the mixture vigorously for about 2 hours. Note: more alcohol may or may not be added during the mixing process to makeup for lost solvent due to evaporation. Thereafter, blend the mixture to form a uniform dough. Now, once a uniform mixed material is obtained, the material should be manually blended with other preformed and cured stars from other procedures. Note: the object is to embed other preformed cured stars in the comet mixture. The mass of the comet mixture should be 10 to 75 millimeters in diameter, and the embedded stars can range from 2 to 10 millimeters in diameter. Once the desired preformed cured stars have been embedded into the original mixture, the entire mass should then be cured in an oven at moderate temperature so the original comet mixture can harden. The exact effect of the cured stars will depend on how many embedded stars you use and to what size they are, and to what color effects they produce. You can experiment with different stars and different sizes and different ratios to get a whole arsenal of different effects. All the stars (including the embedded ones) should be coated with a thin coating of priming mixture in the usual manner for proper ignition and burn.

Burn rate: Typical for star compositions.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: (Commit mixture): ***50% potassium chlorate, 30% zirconium silicate, 10% bentonite clay, 9% barium carbonate, 1% guar gum***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create brilliant combination effects.

Section 4: Firework Strobe, Smoke Stars, and Smoke Agents

- Firework Strobe, Smoke Stars, and Smoke Agent Compositions in this section -

1. 07-04-001A: Brilliant "twinkling" green strobe star: *58.25% ammonium perchlorate, 22.33% magnesium powder, 16.5% barium sulfate, 2.91% nitrocellulose, 0.01% impurities*	**2. 07-04-001B: Brilliant "twinkling" green strobe star:** *55.55% ammonium perchlorate, 21.29% magnesium powder, 15.74% barium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.03% impurities*
3. 07-04-001C: Brilliant "twinkling" green strobe star: *26.59% ammonium perchlorate, 21.27% barium nitrate, 15.95% sulfur, 15.95% magnesium powder, 9.57% magnalium alloy, 3.72% antimony trisulfide, 2.65% hexachlorobenzene, 2.65% potassium dichromate, 1.59% nitrocellulose, 0.06% residue*	**4. 07-04-002A: Brilliant "twinkling" red strobe star:** *50% ammonium perchlorate, 23% magnesium powder, 18% strontium sulfate, 7% magnalium 50/50 alloy, 2% dextrin*
5. 07-04-002B: Brilliant "twinkling" red strobe star: *46.29% ammonium perchlorate, 27.77% magnesium powder, 18.51% strontium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.04% residual balance*	**6. 07-04-002C: Brilliant "twinkling" white strobe star:** *53.68% barium nitrate, 20% sulfur, 18.94% magnalium, 7.36% potassium nitrate, 0.02% impurities*
7. 07-04-002D: Brilliant "twinkling" white strobe star: *55.55% ammonium perchlorate, 23.14% magnalium 50/50 alloy, 13.88% barium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.04% balance*	**8. 07-04-003A Brilliant "twinkling" orange strobe star:** *55.55% ammonium perchlorate, 27.77% magnesium, 9.25% calcium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.04% impurities*
9. 07-04-004A: Brilliant "twinkling" yellow strobe star: *32.03% barium nitrate, 26.21% sulfur, 11.65% magnalium alloy, 10.67% hexachlorobenzene, 6.79% potassium nitrate, 4.85% sodium oxalate, 4.85% antimony trisulfide, 2.91% nitrocellulose, 0.04% mixed balance*	**10. 07-04-005A: Brilliant "twinkling" golden strobe star:** *52.94% potassium nitrate, 11.76% sodium oxalate, 8.82% antimony trisulfide, 8.82% aluminum flake, 8.82% lampblack, 8.82% sulfur, 0.05% mixed residue*
11. 07-04-006A: Brilliant "twinkling" blue strobe star: *55.55% ammonium perchlorate, 21.29% magnesium powder, 15.74% copper sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.03% mixed balance*	**12. 07-04-007A: Red smoke strobe star:** *29.12% rhodamine B dye, 27.18% potassium chlorate, 21.35% oil orange, 19.41% meal powder, 2.91% glutinous rice starch, 0.03 balance*
13. 07-04-008A: Yellow smoke strobe star: *59% realgar mineral, 25% potassium nitrate, 16% sulfur*	**14. 07-04-008B: Yellow smoke strobe star (charcoal modified—increased burn rate):** *44.9% potassium nitrate, 44.9% sulfur, 5.55% rice starch, 2.77% realgar, 1.85% soft wood charcoal, 0.03%% mixed balance*
15. 07-04-008C: Yellow smoke strobe star (hemp coal modified—increased smoke density): *47.77% potassium nitrate, 41.11% realgar, 6.66% rice starch, 4.44% hemp coal, 0.02% impurities*	**16. 07-04-009A: Green smoke strobe star:** *32.03% potassium chlorate, 26.21% milk sugar, 19.41% phthalocyanine coloring agent, 19.41% yellow butter, 2.91% glutinous rice starch, 0.03% mixed residual balance*
17. 07-04-010A: Blue smoke strobe star: *38.83% phthalocyanine blue, 32.03% potassium chlorate, 26.21% milk sugar, 2.91% rice starch, 0.02% residual balance*	**18. 07-04-011A: Violet smoke strobe star:** *28.15% potassium chlorate, 24.27% milk sugar, 16.5% phthalocyanine blue, 15.53% orange oil, 12.62% rhodamine B, 2.91% glutinous rice starch, 0.02% residue*
19. 07-04-012A: Simple white smoke strobe star: *50% potassium nitrate, 30.18% charcoal, 7.54% lampblack, 6.6% sulfur, 5.66% rice starch, 0.02% residual balance*	**20. 07-04-012B: Simple white smoke strobe star (modified composition):** *69.47% potassium nitrate, 13.68% realgar, 11.57% rice starch, 5.26% lampblack, 0.02% mixed balance*
21. 07-04-012C: Simple white smoke strobe star (modified composition 2): *44.9% potassium nitrate, 44.9% sulfur, 5.55% rice starch, 2.77% realgar, 1.85% hemp coal, 0.03% residual balance*	**22. 07-04-013A: Classic colored red fire composition for multiple uses:** *25% potassium chlorate, 25% strontium nitrate, 25% wood fiber, 25% aniline red dye*
23. 07-04-013B: Classic colored green fire composition for multiple uses: *25% potassium chlorate, 25% barium nitrate, 25% wood fiber, 25% aniline green dye*	**24. 07-04-013C: Classic colored blue fire composition for multiple uses:** *25% potassium chlorate, 25% barium nitrate, 25% wood fiber, 25% aniline blue dye*
25. 07-04-014A: Pyrotechnic "safe to handle" greenish-red smoke composition for use in aerial rockets, fountains, and other applications: *34.1% food starch, 30.7% urea-formaldehyde resin, 17% sodium chlorate, 17% rhodamine B, 0.85% urea nitrate, 0.35% mixed impurities*	**26. 07-04-015A: Standard black smoke composition for use in various devices:** *61.9% hexachloroethane, 19% magnesium, 19% anthracene, 0.10% residue*
27. 07-04-016A: Standard white smoke composition for use in fireworks: *45.45% sulfur, 22.72% wood charcoal, 18.18% potassium nitrate, 13.63% wood dust, 0.02% impurities*	**28. 07-04-017A: Standard red smoke composition for use in fireworks:** *65% para-nitroaniline red, 20% lactose, 15% potassium chlorate*
29. 07-04-018A: Standard green smoke composition for use in fireworks: *34.31% potassium chlorate, 25.49% lactose, 25.49% indigo, 14.7% auramine yellow, 0.01% impurities*	**30. 07-04-019A: Standard simple white/black smoke composition for use in fireworks:** *50% potassium nitrate, 50% sugar*
31. 07-04-020A: Standard white smoke composition for use in fireworks and for civil use: *40.59% carbon tetrachloride, 34.65% zinc metal, 19.8% zinc oxide, 4.95% diatomaceous earth, 0.01% balance*	**32. 07-04-021A: Standard white smoke composition for use in fireworks, civil use, and military:** *69% zinc metal, 19% potassium perchlorate, 12% hexachloroethane*
33. 07-04-022A: Classic smoke composition: *45% zinc oxide, 45% hexachloroethane, 10% aluminum powder*	**34. 07-04-022B: Classic smoke composition (modified component):** *58% titanium dioxide, 29% hexachloroethane, 13% aluminum powder*
35. 07-04-022C: Classic smoke composition (modified component—PVC based): *56.69% PVC, 35.43% hexachloroethane, 7.87% aluminum powder, 0.01% balance*	**36. 07-04-023A: Classic smoke composition:** *50% carbon tetrachloride, 25% zinc powder, 20% zinc oxide, 5% diatomaceous earth*

07-04-001A: Brilliant "twinkling" green strobe star:
Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***60 grams of nitrocellulose***, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***460 grams of magnesium powder***, followed by ***340 grams of barium sulfate***, and then followed by ***1200 grams of ammonium perchlorate***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. After 45 minutes, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star of composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *58.25% ammonium perchlorate, 22.33% magnesium powder, 16.5% barium sulfate, 2.91% nitrocellulose, 0.01% impurities*
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-001B: Brilliant "twinkling" green strobe star:
Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***60 grams of nitrocellulose***, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***100 grams of potassium dichromate***, followed by ***340 grams of barium sulfate***, followed by ***1200 grams of ammonium perchlorate***, and then followed by ***460 grams of magnesium powder***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. After 45 minutes, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: *55.55% ammonium perchlorate, 21.29% magnesium powder, 15.74% barium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.03% impurities*
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-001C: Brilliant "twinkling" green strobe star:

Into a suitable empty ball mill, place 15 milliliters of linseed oil, and then add in ***360 grams of powdered magnalium 50/50 alloy***, and then tumble the mixture for about 15 minutes to coat it. Now, into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***60 grams of nitrocellulose***, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***100 grams of hexachlorobenzene***, followed by ***600 grams of flours of sulfur***, followed by ***800 grams of barium nitrate***, followed by 360 grams of the linseed coated magnalium, prepared in the beginning, and then followed by ***140 grams of antimony trisulfide***, and then blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. Now, into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of the usual diameter, place ***100 grams of potassium dichromate***, followed by ***400 grams of strontium sulfate***, followed by ***600 grams of magnesium powder***, and then followed by ***1000 grams of ammonium perchlorate***. Thereafter, add in 250 milliliters of acetone, and then tumble the entire mixture at 100 to 200 RPM for about 1 hour. Finally, place this tumbled mixture into the beaker used for the preparation of the first mixture (containing the nitrocellulose and gently boiling acetone), and then add in 500 milliliters of additional acetone, and then continue to blend the mixture for about 45 minutes. Note: more solvent may be added to compensate for evaporation. Thereafter the dough-like mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***24.03% ammonium perchlorate, 19.23% barium nitrate, 14.42% sulfur, 14.42% magnesium powder, 9.61% strontium nitrate, 8.65% magnalium alloy, 3.36% antimony trisulfide, 2.4% hexachlorobenzene, 2.4% potassium dichromate, 1.44% nitrocellulose, 0.04% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-002A: Brilliant "twinkling" red strobe star:
Into a suitable beaker, place 500 milliliters of distilled water, and then add and dissolve 25 grams of potassium dichromate, and then add in ***460 grams of 130 mesh magnesium powder***, and then blend the mixture for about 5 minutes. Thereafter, filter-off the magnesium, and vacuum dry or air-dry it. Thereafter, place the dried coated magnesium powder into a suitable mixing drum or bowl, equipped with motorized stirrer, and then add in 400 milliliters of acetone, and then add in ***140 grams of magnalium 50/50 alloy***, followed by ***40 grams of dextrin***, followed by ***360 grams of strontium sulfate***, and then followed by ***1000 grams of ammonium perchlorate***. Thereafter, blend the mixture for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. After 45 minutes, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***50% ammonium perchlorate, 23% magnesium powder, 18% strontium sulfate, 7% magnalium 50/50 alloy, 2% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-002B: Brilliant "twinkling" red strobe star:
Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***60 grams of nitrocellulose***, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***600 grams of magnesium powder***, followed by ***100 grams of potassium dichromate***, and then blend the mixture for about 5 minutes. Thereafter, add in ***400 grams of strontium sulfate***, and then followed by ***1000 grams of ammonium perchlorate***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. After 45 minutes, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply

needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star of composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.

Burn rate: Below average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***46.29% ammonium perchlorate, 27.77% magnesium powder, 18.51% strontium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.04% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-002C: Brilliant "twinkling" white strobe star:
Into a suitable empty ball mill, place ***360 grams of magnalium 50/50 alloy***, and then add in 15 milliliters of linseed oil, and then tumble the mixture for about 5 minutes to coat the magnalium. Now, place this coated magnalium product into a suitable mixing bowl, or similar container, equipped with motorized stirrer, and then add in ***1020 grams of barium nitrate***, followed by ***380 grams of powdered sulfur***, followed by ***140 grams of potassium nitrate***, and then followed by ***100 grams of dextrin***. Thereafter, add in 400 milliliters of acetone, and then blend the mixture for about 30 minutes to form a good uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll the stars onto existing stars or bursting charges to form an outer layer of any desired diameter. Either way, the final product needs to be cured in an oven at ordinary temperature in the usual manner. Prime with a thin layer of black powder or potassium perchlorate primer.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¼
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***51% barium nitrate, 19% sulfur, 18% magnalium, 7% potassium nitrate, 5% dextrin***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-002D: Brilliant "twinkling" white strobe star:
Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***60 grams of nitrocellulose***, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***500 grams of magnalium 50/50 alloy***, followed by ***1200 grams of ammonium perchlorate***, followed by ***300 grams of barium sulfate***, and then followed by ***100 grams of potassium dichromate***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. After 45 minutes, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¼
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***55.55% ammonium perchlorate, 23.14% magnalium 50/50 alloy, 13.88% barium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.04% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-003A Brilliant "twinkling" orange strobe star:

Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in *60 grams of nitrocellulose*, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***600 grams of magnesium powder***, followed by ***1200 grams of ammonium perchlorate***, followed by ***200 grams of calcium sulfate***, and then followed by ***100 grams of potassium dichromate***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. After 45 minutes, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star of composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¼
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***55.55% ammonium perchlorate, 27.77% magnesium, 9.25% calcium sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.04% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-004A: Brilliant "twinkling" yellow strobe star:
Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***60 grams of nitrocellulose***, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***660 grams of barium nitrate***, followed by ***100 grams of antimony trisulfide***, followed by ***140 grams of potassium nitrate***, followed by ***220 grams of hexachlorobenzene***, followed by ***540 grams of sulfur***, and then followed by ***100 grams of sodium oxalate***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. In the meantime, place ***240 grams of magnalium 50/50 alloy*** into an empty ball mill, and then add in 15 milliliters of linseed oil, and then tumble the mixture for about 5 minutes. Thereafter, remove the coated magnalium alloy, and then add it to the previous mixture. Note: more acetone may be needed to compensate for loss by evaporation. Thereafter, continue to blend the entire mixture for about 15 to 20 minutes. Thereafter, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.
Burn rate: Below average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***32.03% barium nitrate, 26.21% sulfur, 11.65% magnalium alloy, 10.67% hexachlorobenzene, 6.79% potassium nitrate, 4.85% sodium oxalate, 4.85% antimony trisulfide, 2.91% nitrocellulose, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-005A: Brilliant "twinkling" golden strobe star:
Into a suitable beaker, place 350 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***200 grams of sodium oxalate***, followed by ***150 grams of antimony trisulfide***, followed by ***900 grams of potassium nitrate***, followed by ***150 grams of sulfur***, followed by ***150 grams of lampblack***, and then followed by ***150 grams of aluminum medium coarse flake***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. Thereafter, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.
Burn rate: Average.
Water resistance: Good.

Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***52.94% potassium nitrate, 11.76% sodium oxalate, 8.82% antimony trisulfide, 8.82% aluminum flake, 8.82% lampblack, 8.82% sulfur, 0.05% mixed residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-006A: Brilliant "twinkling" blue strobe star:
Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***60 grams of nitrocellulose***, and then stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***460 grams of magnesium powder***, and then followed by ***100 grams of potassium dichromate***. Thereafter, blend the mixture for about 10 minutes. Thereafter, add in ***1200 grams of ammonium perchlorate***, and then followed by ***340 grams of copper-II-sulfate***. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.
Burn rate: Typical.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***55.55% ammonium perchlorate, 21.29% magnesium powder, 15.74% copper sulfate, 4.62% potassium dichromate, 2.77% nitrocellulose, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-04-007A: Red smoke strobe star:
Into a suitable mixing bowl, equipped with motorized stirrer, place 400 milliliters of hexane, and then add in ***60 grams of glutinous rice starch***, followed by ***600 grams of rhodamine B dye***, followed by ***400 grams of meal powder***, followed by ***560 grams of potassium chlorate***, and then followed by ***440 grams of "oil orange" product***. Thereafter, blend the mixture on moderate speed for about 15 to 20 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. Note: some of the solvent may need to be evaporated before rolling. To use, simply roll the mixture into stars of any desired diameter, or roll onto existing stars to form a second coating, and then cure the stars in an oven at ordinary temperature. Prime with black powder, or perchlorate in the usual manner.
Burn rate: Slow.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***29.12% rhodamine B dye, 27.18% potassium chlorate, 21.35% oil orange, 19.41% meal powder, 2.91% glutinous rice starch, 0.03 balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-008A: Yellow smoke strobe star:
Into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***1180 grams of realgar mineral***, and then tumble it at 300 RPM for about 30 minutes. Thereafter, place this tumbled realgar into a suitable mixing bowl, equipped with motorized stirrer, followed by 375 milliliters of hexane, and then add in ***500 grams of potassium nitrate***, and then followed by ***320 grams of flours of sulfur***. Thereafter, blend the mixture on moderate speed for about 15 to 20 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll onto existing stars to form a second coating, and then cure the stars in an oven at ordinary temperature. Prime with black powder, or perchlorate in the usual manner.
Burn rate: Slow.

Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***59% realgar mineral, 25% potassium nitrate, 16% sulfur***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-008B: Yellow smoke strobe star (charcoal modified—increased burn rate):
Into a suitable ball mill, filled with 100 grams of heavy Teflon coated steel shot, place ***60 grams of realgar mineral***, and then tumble it at 300 RPM for about 30 minutes. Thereafter, place this tumbled realgar into a suitable mixing bowl, equipped with motorized stirrer, followed by 450 milliliters of 95% ethyl alcohol, and then add in ***120 grams of glutinous rice starch***, followed by ***40 grams of powdered soft wood charcoal***, followed by ***970 grams of powdered sulfur***, and then followed by ***970 grams of potassium nitrate***. Thereafter, blend the mixture on moderate speed for about 15 to 20 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll onto existing stars to form a second coating, and then cure the stars in an oven at ordinary temperature. Prime with black powder, or perchlorate in the usual manner.
Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***44.9% potassium nitrate, 44.9% sulfur, 5.55% rice starch, 2.77% realgar, 1.85% soft wood charcoal, 0.03%% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-008C: Yellow smoke strobe star (hemp coal modified—increased smoke density):
As in the previous example, into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***740 grams of realgar mineral***, and then tumble it at 300 RPM for about 30 minutes. Thereafter, place this tumbled realgar into a suitable mixing bowl, equipped with motorized stirrer, followed by 375 milliliters of acetone, and then add in ***120 grams of glutinous rice starch***, followed by ***80 grams of finely divided hemp coal***, and then followed by ***860 grams of potassium nitrate***. Thereafter, blend the mixture on moderate speed for about 15 to 20 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll onto existing stars to form a second coating, and then cure the stars in an oven at ordinary temperature. Prime with black powder, or perchlorate in the usual manner.
Burn rate: Typical for smoke stars.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47.77% potassium nitrate, 41.11% realgar, 6.66% rice starch, 4.44% hemp coal, 0.02% impurities***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-009A: Green smoke strobe star:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner, place 300 milliliters of acetone, and then add in ***60 grams of glutinous rice starch***, followed by ***400 grams of "yellow butter" compound***, followed by ***400 grams of phthalocyanine blue coloring agent***, followed by ***540 grams of mil sugar*** commercial product, and then followed by ***660 grams of potassium chlorate***. Thereafter, blend the mixture for about 30 minutes. Note: more acetone may or may not be needed to compensate for evaporation. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled onto existing stars to form an outer layer, and then cured in an oven at ordinary temperature in the usual manner. The mixture can be used in loose form of any desired grain size, or pressed into pellets, tablets, ect., Prime with any desired mixture.
Burn rate: Moderate
Water resistance: Good.
Stability: Can be stored for many years.

Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***32.03% potassium chlorate, 26.21% milk sugar, 19.41% phthalocyanine coloring agent, 19.41% yellow butter, 2.91% glutinous rice starch, 0.03% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-010A: Blue smoke strobe star:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner, place 300 milliliters of acetone, and then add in ***60 grams of glutinous rice starch***, followed by ***540 grams of milk sugar***, followed by ***800 grams of phthalocyanine blue coloring agent***, and then followed by ***660 grams of potassium chlorate***. Thereafter, blend the mixture for about 30 minutes. Note: more acetone may or may not be needed to compensate for evaporation. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled onto existing stars to form an outer layer, and then cured in an oven at ordinary temperature in the usual manner. The mixture can be used in loose form of any desired grain size, or pressed into pellets, tablets, ect., Prime with any desired mixture.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***38.83% phthalocyanine blue, 32.03% potassium chlorate, 26.21% milk sugar, 2.91% rice starch, 0.02% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-011A: Violet smoke strobe star:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner, place 375 milliliters of 95% ethyl alcohol, and then add in ***60 grams of glutinous rice starch***, followed by ***500 grams of milk sugar***, followed by ***340 grams of phthalocyanine blue coloring agent***, followed by ***320 grams of "orange oil" commercial product***, followed by ***260 grams of rhodamine B coloring agent***, and then followed by ***580 grams of potassium chlorate***. Thereafter, blend the mixture for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled onto existing stars to form an outer layer, and then cured in an oven at ordinary temperature in the usual manner. The mixture can be used in loose form of any desired grain size, or pressed into pellets, tablets, ect., Prime with any desired mixture.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***28.15% potassium chlorate, 24.27% milk sugar, 16.5% phthalocyanine blue, 15.53% orange oil, 12.62% rhodamine B, 2.91% glutinous rice starch, 0.02% residue***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-012A: Simple white smoke strobe star:
As in previous examples, into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner, place 400 milliliters of 95% ethyl alcohol, and then add in ***120 grams of glutinous rice starch***, followed by ***640 grams of finely ground charcoal***, followed by ***160 grams of lampblack***, followed by ***140 grams of flours of sulfur***, and then followed by ***1060 grams of potassium nitrate***. Thereafter, blend the mixture for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled onto existing stars to form an outer layer, and then cured in an oven at ordinary temperature in the usual manner. The mixture can be used in loose form of any desired grain size, or pressed into pellets, tablets, ect., Prime with any desired mixture.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.

Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium nitrate, 30.18% charcoal, 7.54% lampblack, 6.6% sulfur, 5.66% rice starch, 0.02% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-012B: Simple white smoke strobe star (modified composition):

As in the previous example, into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner, place 400 milliliters of hexane, and then add in ***220 grams of glutinous rice starch***, followed by ***260 grams of finely ground realgar***, followed by ***100 grams of lampblack***, and then followed by ***1320 grams of potassium nitrate***. Thereafter, blend the mixture for about 30 minutes in the usual manner. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled onto existing stars to form an outer layer, and then cured in an oven at ordinary temperature in the usual manner. The mixture can be used in loose form of any desired grain size, or pressed into pellets, tablets, ect., Prime with any desired mixture.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***69.47% potassium nitrate, 13.68% realgar, 11.57% rice starch, 5.26% lampblack, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-012C: Simple white smoke strobe star (modified composition 2):

As in previous example, into a suitable mixing bowl, or similar container, equipped with motorized stirrer in the usual manner, place 400 milliliters of hexane, and then add in ***120 grams of glutinous rice starch***, followed by ***60 grams of finely ground realgar***, followed by ***40 grams of finely ground hemp coal***, followed by ***970 grams of sulfur***, and then followed by ***970 grams of potassium nitrate***. Thereafter, blend the mixture for about 30 minutes in the usual manner. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled onto existing stars to form an outer layer, and then cured in an oven at ordinary temperature in the usual manner. The mixture can be used in loose form of any desired grain size, or pressed into pellets, tablets, ect., Prime with any desired mixture.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 4+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***44.9% potassium nitrate, 44.9% sulfur, 5.55% rice starch, 2.77% realgar, 1.85% hemp coal, 0.03% residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored smoke effects for multiple purposes.

07-04-013A: Classic colored red fire composition for multiple uses:

Into a suitable empty ball mill, or vertical mixer, place ***200 grams of finely ground wood fiber***, followed by ***200 grams of strontium nitrate***. Thereafter, tumble or rotate the mixture at 75 RPM for about 30 minutes. Thereafter, add in 75 milliliters of 95% ethyl alcohol, followed by ***200 grams of potassium chlorate***, and then followed by ***200 grams of aniline red dye***. Thereafter, continue to tumble or rotate the mixture at 250 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, rods, or coated onto any desired material, pressed into cones, fountains, or the like, or formed into any desired body, and then cured in an oven at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.

Percentage: ***25% potassium chlorate, 25% strontium nitrate, 25% wood fiber, 25% aniline red dye***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored fire effects for multiple purposes.

07-04-013B: Classic colored green fire composition for multiple uses:

Into a suitable empty ball mill, or vertical mixer, place ***200 grams of finely ground wood fiber***, followed by ***200 grams of barium nitrate***. Thereafter, tumble or rotate the mixture at 75 RPM for about 30 minutes. Thereafter, add in 75 milliliters of 95% ethyl alcohol, followed by ***200 grams of potassium chlorate***, and then followed by ***200 grams of aniline green dye***. Thereafter, continue to tumble or rotate the mixture at 250 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, rods, or coated onto any desired material, pressed into cones, fountains, or the like, or formed into any desired body, and then cured in an oven at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***25% potassium chlorate, 25% barium nitrate, 25% wood fiber, 25% aniline green dye***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored fire effects for multiple purposes.

07-04-013C: Classic colored blue fire composition for multiple uses:

Into a suitable empty ball mill, or vertical mixer, place ***200 grams of finely ground wood fiber***, followed by ***200 grams of finely ground bluestone***. Thereafter, tumble or rotate the mixture at 75 RPM for about 30 minutes. Thereafter, add in 75 milliliters of 95% ethyl alcohol, followed by ***200 grams of potassium chlorate***, and then followed by ***200 grams of aniline blue dye***. Thereafter, continue to tumble or rotate the mixture at 250 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed into tablets, pellets, rods, or coated onto any desired material, pressed into cones, fountains, or the like, or formed into any desired body, and then cured in an oven at moderate temperature.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4
Tendency to cake: None.
Explosive ability: None.
Percentage: ***25% potassium chlorate, 25% barium nitrate, 25% wood fiber, 25% aniline blue dye***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create colored fire effects for multiple purposes.

07-04-014A: Pyrotechnic "safe to handle" greenish-red smoke composition for use in aerial rockets, fountains, and other applications:

Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place ***50 grams of absolutely dry sodium chlorate***, followed by ***100 grams of food grade starch***, followed by ***2.5 grams of urea nitrate***, followed by ***50 grams of rhodamine B***, and then gently dry blend the mixture for about 10 minutes. Thereafter, add in ***90 grams of a urea-formaldehyde resin*** (commercially available), and then continue to gently blend the mixture for about 15 minutes. Thereafter, press the mixture into any desirable pellets, disc, rods, rockets (above the propellant), or roll the pasty mass into stars, or cut stars of any desirable size and shape, and then cure the pellets, discs, rockets, ect., in an oven at 80 Celsius for about 3 to 4 minutes. Can be ignited using any standard means.

Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***34.1% food starch, 30.7% urea-formaldehyde resin, 17% sodium chlorate, 17% rhodamine B, 0.85% urea nitrate, 0.35% mixed impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for producing smoke for use in cones/fountains, smoke bombs, rockets, and smoke trails for aerial shells.

07-04-015A: Standard black smoke composition for use in various devices:
Into a suitable bal mill, filled with 200 grams of Teflon coated steel shot of the usual diameter and weight, place ***130 grams of hexachloroethane***, followed by ***40 grams of standard magnesium powder***, and then followed by ***40 grams of anthracene***, and then tumble the mixture on moderate speed for about 30 to 45 minutes to form a uniform mixture. Thereafter, the mixture is ready to be pressed. To do so, the mixture simply needs to be pressed into any desirable container, mold, cone, tube, ect under a pressure of about 3000 to 6000 psi in the usual manner. Can be ignited using a black powder pellet or equivalent.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.9% hexachloroethane, 19% magnesium, 19% anthracene, 0.10% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Very common composition for the production of black smoke for various applications.

07-04-016A: Standard white smoke composition for use in fireworks:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter and weight, place ***200 grams of potassium nitrate***, followed by ***250 grams of standard wood charcoal***, followed by ***500 grams of flours of sulfur***, and then followed by ***150 grams of finely ground wood dust,*** and then tumble the mixture on moderate speed for about 30 to 45 minutes to form a uniform mixture. Thereafter, the mixture is ready to be pressed. To do so, simply place the mixture into any desirable mixing container equipped with motorized stirrer, and then add in 75 milliliters of alcohol, and then blend the mixture for about 10 minutes to form a mild paste. Thereafter, simply press the pasty mass into any desirable container, mold, cone, tube, ect under a pressure of about 6000 psi in the usual manner, and then allow the firework munitions to cure. Can be ignited using any standard means.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ¼
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45.45% sulfur, 22.72% wood charcoal, 18.18% potassium nitrate, 13.63% wood dust, 0.02% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Very common composition for the production of white smoke for various purposes.

07-04-017A: Standard red smoke composition for use in fireworks:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter and weight, place ***300 grams of potassium chlorate***, followed by ***1300 grams of para-nitroaniline red***, and then followed by ***400 grams of flours of lactose,*** and then tumble the mixture on moderate speed for about 20 minutes to form a uniform mixture. Thereafter, the mixture is ready to be pressed. To do so, simply place the mixture into any desirable mixing container equipped with motorized stirrer, and then add in 75 milliliters of hexane, and then blend the mixture for about 10 minutes to form a mild paste. Thereafter, simply press the pasty mass into any desirable container, mold, cone, tube, ect under a pressure of about 6000 psi in the usual manner, and then allow the firework munitions to cure. Should be ignited using any standard ignition composition.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***65% para-nitroaniline red, 20% lactose, 15% potassium chlorate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Very common composition for the production of red smoke for various purposes.

07-04-018A: Standard green smoke composition for use in fireworks:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***390 grams of standard commercially available indigo***, followed by ***225 grams of synthetic commercially available yellow auramine compound,*** followed thereafter by ***525 grams of potassium chlorate,*** and then followed by ***390 grams of lactose.*** Thereafter, add in 250 milliliters of acetone, and then blend the mixture until the bulk of the acetone evaporates. Thereafter, place the semi-dry mass onto a shallow pan or tray, and allow to thoroughly air-dry. Once it has, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumble the mass at 250 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed under high pressure into any desirable smoke ball, container, mold, ect., under a pressure of about 10,000 psi. The mixture should be ignited using any standard ignition composition.

Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***34.31% potassium chlorate, 25.49% lactose, 25.49% indigo, 14.7% auramine yellow, 0.01% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Very common composition for the production of green smoke for various purposes.

07-04-019A: Standard simple white/black smoke composition for use in fireworks:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***250 grams of potassium nitrate,*** and then followed by ***250 grams of powdered sugar.*** Thereafter, add in 125 milliliters of ether, and then blend the mixture until the bulk of the ether evaporates. Thereafter, place the semi-dry mass onto a shallow pan or tray, and allow to thoroughly air-dry. Once it has, place the dried mass into a suitable ball mill, filled with Teflon coated steel shot of the usual diameter, and then tumble the mass at 250 RPM for about 30 to 40 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be pressed under high pressure into any desirable smoke ball, container, mold, ect., under a pressure of about 10,000 psi. The mixture should be ignited using any standard ignition composition.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium nitrate, 50% sugar***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Very common composition for the production of cloudy smoke for various purposes.

07-04-020A: Standard white smoke composition for use in fireworks and for civil use:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of 10 millimeters in diameter, followed by ***175 grams of finely powdered zinc metal,*** followed by ***205 grams of carbon tetrachloride,*** followed by ***100 grams of powdered zinc oxide,*** and then followed by ***25 grams of diatomaceous earth.*** Thereafter, tumble the mixture at room temperature or elevated temperature of 40 to 50 Celsius for about 1 hour. Note: keep the ball mill sealed (not air-tight) so the carbon tetrachloride does not evaporate. After 1 hour, the mixture is ready for use. To use, simple press the mixture into any desirable smoke grenade ball, grenade, container, mold, ect., and then chill the munitions at low temperature for 48 hours. Requires high temperature ignition composition for proper ignition.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4 ¾
Ease of ignition (1 to 10): 3
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.59% carbon tetrachloride, 34.65% zinc metal, 19.8% zinc oxide, 4.95% diatomaceous earth, 0.01% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to generate copious amounts of white smoke for use in specialty fireworks, but also used in commercial smoke generating compositions and formally in military munitions.

07-04-021A: Standard white smoke composition for use in fireworks, civil use, and military:
Into a suitable mixing bowl, blender, container, ect., equipped with motorized stirrer in the usual manner, place 75 milliliters of hexane, followed by ***345 grams of finely powdered zinc metal,*** followed by ***95 grams of potassium perchlorate,*** and then followed by ***60 grams of hexachloroethane.*** Thereafter, blend the mixture for about 30 minutes to form a stiff paste. Thereafter, place the semi-pasty mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Once it has, place the dried mass into a suitable ball mill, filled with 250 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at room temperature for about 1

hour. After 1 hour, the mixture is ready for use. To use, simply moistened the powder with a small amount of alcohol to form a paste, and then press the mixture into any desirable smoke grenade ball, grenade, container, mold, ect., and then cure the munitions in an oven at 50 to 60 Celsius until thoroughly dry. Requires proper ignition composition for proper burn.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 4 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***69% zinc metal, 19% potassium perchlorate, 12% hexachloroethane***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to generate copious amounts of white smoke for use in specialty fireworks, but also used in commercial smoke generating compositions and formally in military munitions.

07-04-022A: Classic smoke composition:
Into a suitable mixing bowl, blender, container, ect., equipped with motorized stirrer in the usual manner, place 200 milliliters of hexane, followed by ***450 grams of finely powdered zinc metal,*** followed by ***450 grams of hexachloroethane,*** and then followed by ***100 grams of aluminum powder.*** Thereafter, blend the mixture for about 30 minutes to form a stiff paste. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable smoke grenade ball, grenade, container, mold, ect., and then cure the munitions in an oven at 50 to 60 Celsius until thoroughly dry. Requires proper ignition composition for proper burn.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 3+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% zinc oxide, 45% hexachloroethane, 10% aluminum powder***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to generate copious amounts of white smoke for use in specialty fireworks, but also used in commercial smoke generating compositions and formally in military munitions.

07-04-022B: Classic smoke composition (modified component):
Into a suitable mixing bowl, blender, container, ect., equipped with motorized stirrer in the usual manner, place 200 milliliters of hexane, followed by ***225 grams of finely powdered titanium dioxide,*** followed by ***450 grams of hexachloroethane,*** and then followed by ***100 grams of aluminum powder.*** Thereafter, blend the mixture for about 30 minutes to form a stiff paste. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable smoke grenade ball, grenade, container, mold, ect., and then cure the munitions in an oven at 50 to 60 Celsius until thoroughly dry. Requires proper ignition composition for proper burn (magnesium based composition).
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 3+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58% titanium dioxide, 29% hexachloroethane, 13% aluminum powder***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to generate copious amounts of white smoke for various purposes.

07-04-022C: Classic smoke composition (modified component—PVC based):
Into a suitable ball mill, filled with 200 grams of heavy Teflon coated steel shot, place ***720 grams of finely powder PVC,*** and then followed by ***450 grams of hexachloroethane.*** Thereafter, add in 75 milliliters of acetone, and then tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, blender, container, ect., equipped with motorized stirrer in the usual manner, and then place 300 milliliters of hexane, followed by ***100 grams of finely powdered aluminum.*** Thereafter, blend the mixture for about 30 minutes to form a stiff paste. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable smoke grenade ball, grenade, container, mold, ect., and then cure the munitions in an oven at 50 to 60 Celsius until thoroughly dry. Requires proper ignition composition for proper burn (magnesium based composition).
Burn rate: Slow.

Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 3
Tendency to cake: None.
Explosive ability: None.
Percentage: ***56.69% PVC, 35.43% hexachloroethane, 7.87% aluminum powder, 0.01% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to generate copious amounts of white smoke for various purposes.

07-04-023A: Classic smoke composition:
Into a suitable ball mill, filled with 300 grams of heavy Teflon coated steel shot, place ***500 grams of powdered zinc,*** and then followed by ***400 grams of finely powdered zinc oxide.*** Thereafter, tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, blender, container, ect., equipped with motorized stirrer in the usual manner, and then add in ***1000 grams of carbon tetrachloride,*** followed by ***100 grams of diatomaceous earth.*** Thereafter, blend the mixture for about 50 minutes at a temperature ranging from 30 to 50 Celsius. Thereafter, before the mixture cools to room temperature, the mixture is ready for use. To use, simply press the mixture into any desirable smoke grenade ball, grenade, container, mold, ect., and then cure the munitions in an oven at 50 to 60 Celsius until thoroughly dry. Requires proper ignition composition for proper burn (magnesium based composition).
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 3
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% carbon tetrachloride, 25% zinc powder, 20% zinc oxide, 5% diatomaceous earth***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to generate copious amounts of white smoke for various purposes.

Section 5: Fountains, Cones, Sparklers, and Bengal Lights

- Fountains, Cones, Sparklers, and Bengal Light Compositions in this section -

1. 07-05-001A: Green sparkler/bengal composition: *47.2% barium nitrate, 40.5% iron, 6.7% aluminum, 2.7% shellac, 2.7% animal glue, 0.20% residue*	**2. 07-05-001B: Red sparkler/bengal composition:** *47.2% strontium nitrate, 40.5% iron, 6.7% aluminum, 2.7% shellac, 2.7% animal glue, 0.20% residue*
3. 07-05-001C: “White-flash” sparkler/bengal composition: *47.2% magnesium nitrate, 27% iron, 20.2% magnesium, 2.7% shellac, 2.7% animal glue, 0.20% residue*	**4. 07-05-002A: Red smokeless bengal fire composition:** *55.4% strontium nitrate, 27.6% potassium chlorate, 13.8% gum shellac, 1.7% gum camphor, 0.85% brass, 0.42% magnesium hydroxide, 0.230% impurities*
5. 07-05-003A: Urea-formaldehyde composition for fountains/cones: *58% potassium perchlorate, 29% urea-formaldehyde resin, 9.6% aluminum, 3.2% strontium oxalate, 0.2% residue*	**6. 07-05-004A: Bright-light sparkler composition:** *42.6% starch, 16.9% dextrin, 12.8% wood charcoal, 10.6% magnesium, 8.5% iron fillings, 8.3% gum Arabic, 0.30% paraffin and linseed oil*
7. 07-05-005A: Brilliant sparkler composition: *49.7% barium nitrate, 31.1% steel chips, 12.4% dextrin, 6.3% aluminum, 0.3% sodium bicarbonate filler, 0.2% linseed oil*	**8. 07-05-006A: Brilliant white, green, and red spark producing bengal light composition:** *55.5% barium nitrate, 22.2% shellac, 11.1% dextrin, 11.1% aluminum, 0.1% residue*
9. 07-05-006B: Brilliant greenish spark producing bengal light composition: *47.2% barium nitrate, 40.5% iron powder, 6.7% aluminum powder, 2.7% shellac, 2.7% glue, 0.2% residue*	**10. 07-05-007A: Brilliant reddish bengal light composition:** *40% strontium nitrate, 20% shellac, 12% resin, 7.9% potassium chlorate, 7.9% flour, 7.9% glass, 3.9% strontium chlorate, 0.40% mixed residues*
11. 07-05-008A: Brilliant reddish bengal light composition: *63.1% strontium nitrate, 21% shellac, 15.7% potassium chlorate, 0.20% mixed residues*	**12. 07-05-009A: Bengal light composition for matchsticks:** *78.9% lead nitrate, 10.5% wood charcoal, 10.5% steel chips, 0.10% mixed balance*
13. 07-05-010A: Standard fountain composition: 45% barium nitrate, 45% aluminum powder, 5% meal powder, 5% potassium nitrate	**14. 07-05-011A: Standard fountain composition:** *40% potassium nitrate, 40% meal powder, 12% sulfur, 8% wood charcoal*
15. 07-05-011B: Standard fountain composition: *79% soft wood charcoal, 11.5% meal powder, 3.8% potassium nitrate, 3.8% coarse iron, 1.9% sulfur*	**16. 07-05-011C: Standard fountain composition:** *53% potassium nitrate, 20% sulfur, 20% meal flour, 6.6% antimony trisulfide, 0.4% residue balance*
17. 07-05-011A: Classic fountain composition used in fireworks: *67.79% meal powder, 15.25% antimony trisulfide, 10.16% sodium oxalate, 6.77% dextrin, 0.03% impurities*	**18. 07-05-012A: Classic blue fountain composition used in cones and fountains:** *66.66% ammonium perchlorate, 19% stearin, 9.5% copper-II-oxide, 4.76% shellac, 0.08% balance*
19. 07-05-013A: Classic Bengal light composition with improved burning rate: *38% ammonium perchlorate, 29% iron powder, 17% poly vinyl butyl rubber, 7% aluminum, 5% di-butylphthalate, 4% ammonium nitrate catalyst*	**20. 07-05-014A: Classic Bengal light composition with improved intensity:** *38% ammonium perchlorate, 29% iron powder, 17% poly vinyl butyl rubber, 7% aluminum, 5% di-butylphthalate, 4% ammonium nitrate catalyst*
21. 07-05-014B: Classic green Bengal light composition: *59% barium nitrate, 23% barium chlorate, 10% shellac, 6% potassium chlorate, 2% stearic acid*	**22. 07-05-015A: Classic blue Bengal light composition for use in blue lights:** *28% potassium chlorate, 27% potassium nitrate, 15% sulfur, 15% potassium sulfate, 15% copper-II-ammonium sulfate*
23. 07-05-016A: Classic blue Bengal light composition for use in blue fires: *23% potassium chlorate, 23%potassium sulfate, 18% sulfur, 15% copper-II-sulfate, 12% mercury-I-chloride, 9% shellac*	**24. 07-05-016B: Classic red Bengal light composition for use in red fires:** *66% strontium nitrate, 25% potassium chlorate, 9% shellac*
25. 07-05-016C: Classic red Bengal light composition for use in red fires (fortified with kauri powder): *50% potassium chlorate, 21% Kauri powder, 17% strontium nitrate, 12% strontium nitrate*	**26. 07-05-016D: Classic red Bengal light composition for use in red fires:** *52.28% strontium nitrate, 14.37% sulfur, 11.76% potassium perchlorate, 10.45% wood, 7.84% Vaseline, 1.3% sugar, 1.3% Colophonium, 0.65% antimony metal, 0.05% balance*
27. 07-05-016E: Classic red Bengal light composition for use in red fires: *50.98% potassium chlorate, 15.68% strontium nitrate, 15.68% mercury-I-chloride, 9.8% sulfur, 3.9% shellac, 3.9% charcoal, 0.06% impurities*	**28. 07-05-017A: Classic green Bengal light composition for use in green fires:** *57% potassium chlorate, 21% sulfur, 21% barium nitrate, 1% balance*
29. 07-05-017B: Classic green Bengal light composition for use in green fires: *48% barium nitrate, 24% potassium chlorate, 12% sulfur, 8% mercury-I-chloride, 4% wood charcoal, 4% shellac*	**30. 07-05-018A: Classic Bengal light composition for use in white fires:** *70% potassium nitrate, 20% sulfur, 10% antimony*
31. 07-05-019A: Classic Bengal light composition for use in yellow fires: *45% potassium chlorate, 18% sodium oxalate, 18% wood charcoal, 9% potassium nitrate, 9% sulfur, 1% residue*	**32. 07-05-019B: Classic Bengal light composition for use in yellow fires:** *54% potassium chlorate, 18% sodium oxalate, 18% sulfur, 9% shellac, 1% residue*
33. 07-05-020A: Classic Bengal light composition for use in purple fires: *33.33% potassium chlorate, 33.33% anhydrous copper sulfate, 33.33% sulfur, 0.01% mixed*	**34. 07-05-021A: Classic sparkler composition:** *40% titanium powder, 40% potassium perchlorate, 18% dextrin, 2% guar gum*
35. 07-05-021B: Classic sparkler composition with spectacular visual effect: *30% iron powder, 20% charcoal, 20% magnesium/aluminum alloy, 20% nitroguanidine, 10% potassium nitrate*	**36. 07-05-022A: Classic basic sparkler composition with spectacular visual effect:** *55.8% grained aluminum, 37% barium chlorate, 6.97% shellac, 0.23% impurities*
37. 07-05-023A: Classic basic sparkler composition with visual effect using black powder base: *43.75% potassium nitrate, 25% soft wood charcoal, 18.75% aluminum, 12.5% sulfur*	**38. 07-05-023B: Classic basic sparkler composition with visual effect using black powder base (modified):** *62.2% potassium nitrate, 13.3% soft wood charcoal, 13.3% sulfur, 8.8% aluminum, 2.4% epoxy resin (such Epon 815)*
39. 07-05-024A: Brilliant spark producing fire composition for use in sparklers or other spark emitting devices: *47% titanium powder, 47% potassium perchlorate, 6% dextrin*	**40. 07-05-025A: Brilliant golden spark producing composition for use in fountains and/or stars:** *58% potassium nitrate, 25.8% sulfur, 16% lamp black, 0.2% balance*
41. 07-05-025B: Brilliant golden spark producing composition for use in fountains and/or stars: *47.61% potassium nitrate, 33.33% iron fillings, 9.5% lampblack, 9.5% sulfur, 0.06% impurities*	**42. 07-05-026A: Brilliant “Japanese sparkler” composition for use in fountains and sparklers:** *54.54% potassium nitrate, 27.27% sulfur, 18.18% soot, 0.01% balance*
43. 07-05-026B: Brilliant “Japanese sparkler” composition for use in fountains and sparklers: *45% realgar mineral, 35% potassium nitrate, 20% soot*	**44. 07-05-027A: Brilliant fountain composition for use in fountains:** *72% meal powder, 7% charcoal, 7% potassium nitrate, 7% dark aluminum, 7% aluminum*
45. 07-05-028A: Brilliant fountain composition for use in fountains: *70% black powder, 26% meal powder, 4% charcoal*	**46. 07-05-029A: Brilliant fountain composition for use in fountains:** *57.14% potassium nitrate, 23.8% coarse iron powder, 9.52% wood charcoal, 9.52% sulfur, 0.02% mixed balance*
47. 07-05-029B: Brilliant fountain composition for use in fountains: *33.33% soft wood charcoal, 33.33% meal powder, 16.66% potassium nitrate, 16.66% coarse iron powder, 0.02% impurities*	**48. 07-05-030A: Brilliant fountain composition for use in fountains and other purposes:** *76.92% meal powder, 15.38% antimony trisulfide, 7.69% aluminum, 0.01% mixed balance*
49. 07-05-031A: Brilliant fountain composition for use in fountains and other purposes: *37.5% potassium nitrate, 25% meal powder, 12.5% sulfur, 12.5% charcoal, 12.5% aluminum powder*	**50. 07-05-032A: Fountain composition for use in fountains and other purposes:** *57.14% meal powder, 28.57% iron flake, 14.28% pine wood charcoal, 0.01% mixed balance*
51. 07-05-033A: Beautiful green “Bengal fire” composition for multiple purposes: *80% barium nitrate, 10% red gum, 10% PVC*	**52. 07-05-034A: Beautiful green “Bengal fire” composition for multiple purposes:** *54.54% barium nitrate, 27.27% potassium nitrate, 18.18% sulfur, 0.01% mixed balance*
53. 07-05-035A: Beautiful blue “Bengal fire” composition for multiple purposes: *47.05% copper ammonium sulfate, 35.29% potassium chlorate, 11.76% willow charcoal, 5.88% shellac, 0.02% mixed balance*	**54. 07-05-035B: Beautiful blue “Bengal fire” composition for multiple purposes:** *75% potassium perchlorate, 15.625% copper ammonium chloride, 6.25% ground stearin, 3.125% asphaltum*
55. 07-05-035C: Beautiful blue “Bengal fire” composition for multiple purposes: *53.84% potassium chlorate, 30.76% sulfur, 15.38% copper-II-sulfide, 0.02% mixed balance*	**56. 07-05-035D: Beautiful blue “Bengal fire” composition for multiple purposes:** *25% potassium nitrate, 25% charcoal, 25% mercury-II-chloride, 25% copper-II-oxide*
57. 07-05-036A: Beautiful blue “Bengal fire” composition for multiple purposes (modified): *66.66% potassium nitrate, 22.22% sulfur, 11.11% antimony trisulfide, 0.01% mixed residual balance*	**58. 07-05-036B: Beautiful blue “Bengal fire” composition for multiple purposes (modified):** *39.43% potassium chlorate, 21.12% potassium nitrate, 19.71% potassium sulfate, 19.71% sulfur, 0.03% residual residue*
59. 07-05-037A: Typical red “fire” composition with multiple uses: *72% potassium chlorate, 16% strontium carbonate, 12% shellac*	**60. 07-05-037B: Typical red “fire” composition with multiple uses:** *55.55% strontium nitrate, 22.22% potassium chlorate, 11.11% charcoal, 11.11% sulfur, 0.01% residual balance*
61. 07-05-037C: Typical red “fire” composition with multiple uses: *39.28% strontium nitrate, 39.28% calcium carbonate, 14.28% sulfur, 3.57% potassium chlorate, 3.57% charcoal, 0.02% balance*	**62. 07-05-037D: Typical red “fire” composition with multiple uses:** *72.5% potassium chlorate, 15% strontium carbonate, 12.5% orange shellac product*
63. 07-05-037E: Simple red “fire” composition with multiple	**64. 07-05-038A: Simple green “fire” composition with**

uses: *80% strontium nitrate, 20% orange shellac*	**multiple uses:** *58.33% barium nitrate, 25% potassium chlorate, 16.66% sulfur, 0.01% residual balance*
65. 07-05-038B: Simple green "fire" composition with white glare: *50% potassium chlorate, 37.5% barium nitrate, 12.5% orange shellac product*	**66. 07-05-039A: Typical white "fire" composition:** *75% potassium nitrate, 21.875% sulfur, 3.125% pine wood charcoal*
67. 07-05-039B: Typical white "fire" composition: *58.62% barium nitrate, 17.24% aluminum powder, 12.06% sulfur, 12.06% potassium perchlorate, 0.02% mixed residue*	**68. 07-05-039C: Typical white "fire" composition:** *75% potassium nitrate, 12.5% sulfur, 12.5% antimony trisulfide*
69. 07-05-039D: Typical white "fire" composition (modified formula): *92.3% potassium nitrate, 3.84% sulfur, 3.84% charcoal, 0.02% residual balance*	**70. 07-05-040A: Standard yellow "fire" composition:** *40% potassium nitrate, 30% sodium chloride, 20% soft wood charcoal, 10% sulfur*
71. 07-05-040B: Standard yellow "fire" composition: *61.53% potassium chlorate, 23.07% sodium carbonate, 15.38% sulfur, 0.02% balance*	**72. 07-05-041A: Classic sparkler composition for different uses:** *63.63% potassium nitrate, 13.63% sulfur, 13.63% charcoal, 9.09% aluminum flake, 0.02% mixed balance*
73. 07-05-041B: Classic sparkler composition for different uses: *60% potassium perchlorate, 30% coarse aluminum flake, 10% dextrin*	**74. 07-05-041C: Classic sparkler composition for different uses:** *63.63% potassium nitrate, 13.63% pine wood charcoal, 13.63% sulfur, 9.09% coarse aluminum flake, 0.02% balance*
75. 07-05-041D: Classic "reddish" sparkler composition for different uses: *83.33% strontium nitrate, 16.66% shellac, 0.01% impurities*	**76. 07-05-041E: Classic "flash" sparkler composition for different uses:** *50% potassium perchlorate, 35% coarse aluminum flake, 15% dextrin*
77. 07-05-041F: Classic "flash" sparkler composition for different uses: *40% potassium perchlorate, 40% coarse titanium fines, 18% dextrin, 2% guar gum*	**78. 07-05-041G: Classic "green" sparkler composition for different uses:** *82.87% barium nitrate, 16.57% coarse aluminum fines, 0.55% charcoal, 0.01% mixed balance*
79. 07-05-042A: Classic "red, white, & blue" sparkler composition: *30% strontium nitrate, 20% potassium perchlorate, 17.5% coarse aluminum fines, 17.5% coarse copper fines, 15% dextrin*	**80. 07-05-043A: Classic sparkler composition:** *50% potassium perchlorate, 35% aluminum powder, 15% dextrin*
81. 07-05-044A: Improved sparkler composition for generating brilliant sparks and star effects: *42.96% potassium nitrate, 23.92% starch, 8.98% magnesium grains, 5.94% lampblack, 5.94% iron fillings, 4.95% gum Arabic, 3.3% animal glue, 2.97% camphor, 0.99% ferric chloride hydrate, 0.05% mixed balance*	**82. 07-05-045A: Dual sparkler composition for generating exploding effects:** *37.5% gum Arabic, 19.16% potassium chlorate, 18.33% red iron oxide, 13.54% phosphorus pentasulfide, 11.45% magnesium carbonate, 0.02% mixed balance*
83. 07-05-045B: Dual sparkler composition for generating exploding effects: *38.23% gum Arabic, 20.57% potassium chlorate, 16.74% black copper-II-oxide, 14.35% phosphorus pentaselenide, 10% magnesium carbonate, 0.11% mixed balance*	**84. 07-05-046A: Classic Bengal light composition:** *64.53% strontium nitrate, 18.74% shellac, 10.67% potassium chlorate, 4.03% animal glue, 2.01% gum tragacanth, 0.02% residual balance*
85. 07-05-047A: Classic Bengal light composition: *62.59% strontium nitrate, 15.59% "copal" material, 15.59% potassium chlorate, 6.21% shellac, 0.02% mixed balance*	

07-05-001A: Green sparkler/bengal composition:
Into a suitable mixing bowl or blender, equipped with motorized stirrer with plastic stir blade, place 500 milliliters of 95% alcohol, or 130 milliliters of denatured alcohol, and then add and dissolve ***40 grams of shellac***, followed by ***40 grams of standard animal glue***. Thereafter, thoroughly blend the mixture to form a uniform mix. Thereafter, add in ***700 grams of barium nitrate***, and then continue to thoroughly blend the mixture for about 30 minutes. After 30 minutes, add in ***100 grams of aluminum powder***, followed by ***600 grams of standard powdered iron***, and then continue to blend the mixture until most of the alcohol has evaporated—keep blending the mixture until a fine paste is formed, but not until all the solvent evaporates. Once a fluidized paste has been formed, it is ready to be used. To do so, there are several ways to use it. The fastest way is to dip your metal rods (the rods can be anywhere from 2 to 10 millimeters in diameter and should be composed of iron) into the paste, and then using a special machine or device, gently spin (rotate) the coated rods until the alcohol has completely dried, and the result are cured dried sparkler sticks. Another method utilizes a special mold where the metal rods are centered within the middle of the tiny molds, and then the paste is injected under presser into said mold, followed by curing. Either way, the tip of the metal rod should be coated with an igniter composition. Note: you can experiment with other types of "rods", for example, instead of using just plain iron rods, different shapes and sizes of designs can be employed, so you can use your imagination.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***47.2% barium nitrate, 40.5% iron, 6.7% aluminum, 2.7% shellac, 2.7% animal glue, 0.20% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks, and can also be used for signaling

07-05-001B: Red sparkler/bengal composition:
Just as in the previous preparation, simply place into a suitable mixing bowl or blender, equipped with motorized stirrer with plastic stir blade, 500 milliliters of 95% alcohol, or 130 milliliters of denatured alcohol, and then add and dissolve ***40 grams of shellac***, followed by ***40 grams of standard animal glue***. Thereafter, thoroughly blend the mixture to form a uniform mix. Thereafter, add in ***700 grams of strontium nitrate,*** rather then barium nitrate, and then continue to thoroughly blend the mixture for about 30 minutes. After 30 minutes, add in ***100 grams of aluminum powder***, followed by ***600 grams of standard powdered iron***, and then continue to blend the mixture until most of the alcohol has evaporated—keep blending the mixture until a fine paste is formed, but not until all the solvent evaporates. Once a fluidized paste has been formed, it is ready to be used. To do so, there are several ways to use it. The fastest way is to dip your metal rods (the rods can be anywhere from 2 to 10 millimeters in diameter and should be composed of iron) into the paste, and then using a special machine or device, gently spin (rotate) the coated rods until the alcohol has completely dried, and the result are cured dried sparkler sticks. Another method utilizes a special mold where the metal rods are centered within the middle of the tiny molds, and then the paste is injected under presser into said mold, followed by curing. Either way, the tip of the metal rod should be coated with an igniter composition. Note: you can experiment with other types of "rods", for example, instead of using just plain iron rods, different shapes and sizes of designs can be employed, so you can use your imagination.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***47.2% strontium nitrate, 40.5% iron, 6.7% aluminum, 2.7% shellac, 2.7% animal glue, 0.20% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks, and can also be used for signaling

07-05-001C: "White-flash" sparkler/bengal composition:
Just as in the previous preparation, simply place into a suitable mixing bowl or blender, equipped with motorized stirrer with plastic stir blade, 500 milliliters of 95% alcohol, or 130 milliliters of denatured alcohol, and then add and dissolve ***40 grams of shellac***, followed by ***40 grams of standard animal glue***. Thereafter, thoroughly blend the mixture to form a uniform mix. Thereafter, add in ***700 grams of anhydrous magnesium nitrate,*** rather then barium nitrate, and then continue to thoroughly blend the mixture for about 30 minutes. After 30 minutes, add in ***300 grams of standard magnesium powder***, followed by ***400 grams of standard powdered iron,*** and then continue to blend the mixture until most of the alcohol has evaporated—keep blending the mixture until a fine paste is formed, but not until all the solvent evaporates. Once a fluidized paste has been formed, it is ready to be used. To do so, there are several ways to use it. The fastest way is to dip your metal rods (the rods can be anywhere from 2 to 10 millimeters in diameter and should be composed of iron) into the paste, and then using a special machine or device, gently spin (rotate) the coated rods until the alcohol has completely dried, and the result are cured dried sparkler sticks. Another method utilizes a special mold where the metal rods are centered within the middle of the tiny molds, and then the paste is injected under presser into said mold, followed by curing. Either way, the tip of the metal rod should be coated with an igniter composition. Note: you can experiment with other types of "rods", for example, instead of using just plain iron rods, different shapes and sizes of designs can be employed, so you can use your imagination.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 8 ½
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***47.2% magnesium nitrate, 27% iron, 20.2% magnesium, 2.7% shellac, 2.7% animal glue, 0.20% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks, and can also be used for signaling and for illumination purposes.

07-05-002A: Red smokeless bengal fire composition:

Into a suitable beaker or container, place 500 milliliters of 95% ethyl alcohol, or denatured alcohol, followed by ***113 grams of gum shellac***, followed by ***14 grams of gum camphor***, followed by ***7 grams of brass shavings***, followed by ***3.5 grams of magnesium hydroxide***, and then blend the mixture using a wooden spatula or equivalent for about 15 to 30 minutes. Thereafter, heat the mixture to about 80 Celsius, and after when the alcohol begins to boil, slowly add in ***226 grams of potassium chlorate***, followed by ***453 grams of strontium nitrate***. Note: while the mixture heats up, and thereafter during the addition of the chlorate and nitrate, maintain a rapid blend of the mixture. After the addition of the chlorate and nitrate, continue to rapidly blend the mixture until half of the alcohol evaporates. When half the alcohol evaporates, remove the heat source, and allow the mixture to cool to room temperature. Afterwards, place the mixture into an ice bath, chilled to about 0 Celsius, and allow it to stand at this temperature for about 1 hour. Note: a freezer can be substituted for an ice bath. After 1 hour, filter-off the insoluble mass, using any filtration process—do not completely suck dry the mixture if using vacuum filtration. Once the wet mass has been recovered, it is ready to be immediately pressed into any desirable shape, such as pencils, tablets, ect., Note: Once the mixture has been pressed into any desirable shape, it should be cured for several days.
Burn rate: Slow.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***55.4% strontium nitrate, 27.6% potassium chlorate, 13.8% gum shellac, 1.7% gum camphor, 0.85% brass, 0.42% magnesium hydroxide, 0.230% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks, and can also be used for signaling purposes.

07-05-003A: Urea-formaldehyde composition for fountains/cones:
Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place ***30 grams of finely divided aluminum***, followed by ***10 grams of strontium oxalate***, followed by ***180 grams of potassium perchlorate***, and then gently dry blend the mixture for about 10 minutes. Thereafter, add in ***90 grams of a urea-formaldehyde resin*** (commercially available), and then continue to gently blend the mixture for about 15 minutes. Thereafter, press the mixture into any desirable cone, fountain, ect, utilizing the normal techniques and then cure the cones, fountains, ect., in an oven at 80 Celsius for about 3 to 4 minutes. Can be ignited using any standard means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58% potassium perchlorate, 29% urea-formaldehyde resin, 9.6% aluminum, 3.2% strontium oxalate, 0.2% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making fountains and cones.

07-05-004A: Bright-light sparkler composition:
Into a suitable ball mill, mixing drum ect, utilizing no steel shot, place ***28.3 grams of finely divided magnesium powder***, followed by ***113 grams of finely divided food grade starch***, and then followed by ***34 grams of finely divided wood charcoal.*** Thereafter, tumble the dry mixture for about 30 minutes at 150 RPM or any desirable rotation speed. Thereafter, prepare a paste by adding ***45 grams of dextrin*** and ***22 grams of gum Arabic*** to about 10 to 15 milliliters of water, and the quickly blend the paste by hand for several minutes, and then add it to the ball mill, and continue to tumble or rotate the mixture for another 30 minutes. After 30 minutes, or during such time, place 2.8 grams of linseed oil and 700 milligrams of paraffin into a beaker, and then gently heat the mixture until the paraffin melts. Thereafter, add in ***22.6 grams of fine grain iron fillings*** (any suitable size will work), and then blend the mixture for several minutes using a metal spatula equivalent. Thereafter, remove the iron fillings and place them on a screen or filter paper to allow any loose liquid to drip off. Once the coated iron fillings are dried, add them to the ball mill, and then continue to blend or tumble the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, it simply needs to be coated onto any desirable surface, such as a metal rod, wood rod, or equivalent. The thickness of the layer can vary. The pasty mixture can also be spread out onto shallow pans for making sheets, cubes, or any other desirable shape or size. Thereafter, the mixture should be allowed to dry for several days, or can be dried in an oven at 50 to 80 Celsius to facilitate evaporation of the water. Can be ignited using an ordinary match.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.6% starch, 16.9% dextrin, 12.8% wood charcoal, 10.6% magnesium, 8.5% iron fillings, 8.3% gum Arabic, 0.30% paraffin and linseed oil***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making sparklers that emit a bright light and a large volume of sparks.

07-05-005A: Brilliant sparkler composition:
Into a suitable ball mill, equipped with heating means, and containing no steel shot, place ***283 grams of fine steel chips or flakes***, and then add in 50 milliliters of linseed oil. Thereafter, tumble the steel chips for about 10 minutes at 65 Celsius to coat them. Thereafter, remove the coated steel chips, and place them on a paper towel and let them stand until they cool to room temperature. Thereafter, place these steel ships into a clean ball mill, containing no steel shot, and then add in ***58 grams of finely powdered aluminum***, followed by ***113 grams of dextrin***, followed by ***453 grams of barium nitrate***, followed by 1.1 grams (5 drops) of concentrated formaldehyde solution, followed by ***2.8 grams of sodium bicarbonate***, and then dilute the entire mixture with about 300 to 400 milliliters of water, and then tumble the entire mixture at 150 RPM for about 10 to 15 minutes to form a fluidized mixture. Thereafter, the mixture is ready for dipping. To do so, the mixture should be placed into a suitable container, and the iron sparkler rods are then dipped, dried, dipped, dried, and re-dipped and re-dried as many times as desirable depending on the desired coating thickness of the sparkler that is desired. Can be ignited by any means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***49.7% barium nitrate, 31.1% steel chips, 12.4% dextrin, 6.3% aluminum, 0.3% sodium bicarbonate filler, 0.2% linseed oil***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making sparklers that emit bright and large volumes of sparks with good sparking radius.

07-05-006A: Brilliant white, green, and red spark producing bengal light composition:
Into a suitable mixing bowl, equipped with motorized stirrer or other means, place ***40 grams of shellac***, and then add in 60 milliliters of 95% ethyl alcohol or denatured alcohol, and then stir the mixture for about 10 minutes to dissolve all the shellac. Thereafter, add in ***100 grams of barium nitrate***, followed by ***20 grams of dextrin***, and then stir the mixture on moderate speed for about 5 minutes. Thereafter, add in ***20 grams of aluminum powder*** of average mesh, and then continue to blend the mixture for about 5 minutes to form a uniform paste. Once the paste has been formed, the mixture is ready to be used. To use it, the mixture simply needs to be coated onto any desirable iron or steel rod, or pressed into any desirable shape for any desired application. In any case, the final device needs to be cured and allowed to dry thoroughly before use. A fulminating head can be attached thereto, so as to ignite the Bengal composition using a striking motion, or a suitable match can be used for ignition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55.5% barium nitrate, 22.2% shellac, 11.1% dextrin, 11.1% aluminum, 0.1% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making Bengal lights that emit brilliant sparks of white, green, and red.

07-05-006B: Brilliant greenish spark producing bengal light composition:
Into a suitable mixing bowl, equipped with motorized stirrer or other means, place ***20 grams of standard animal glue***, followed by 40 milliliters of 95% ethyl alcohol, and then stir the mixture to dissolve all the glue. Thereafter, add in ***20 grams of shellac***, followed by ***350 grams of barium nitrate***, followed by ***50 grams of aluminum powder*** of average mesh, and then continue to blend the mixture for about 5 minutes to form a uniform paste. Thereafter, add in ***300 grams of iron powder*** of average mesh, and then continue to blend the mixture on moderate speed for about 10 minutes. After 10 minutes, the mixture is ready to be used. To use it, the mixture simply needs to be coated onto any desirable iron or steel rod, or pressed into any desirable shape for any desired application in the usual

manner. In any case, the final device needs to be cured and allowed to dry thoroughly before use. A fulminating head can be attached thereto, so as to ignite the Bengal composition using a striking motion, or a suitable match can be used for ignition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47.2% barium nitrate, 40.5% iron powder, 6.7% aluminum powder, 2.7% shellac, 2.7% glue, 0.2% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making Bengal lights that emit brilliant sparks of green with glowing sparks of burning iron.
Note: the barium nitrate can be substituted with strontium nitrate to impart red sparks.

07-05-007A: Brilliant reddish bengal light composition:

Into a suitable beaker, or similar container, place 370 milliliters of 99% isopropyl alcohol, and then add and dissolve ***113 grams of shellac***, followed by ***68 grams of standard resin***, and then stir the mixture briefly to dissolve all solids, or the bulk of the shellac. Thereafter, add in ***226 grams of strontium nitrate***, followed by ***45 grams of potassium chlorate***, followed by ***45 grams of flour***, followed by ***45 grams of powdered glass***, and then followed by ***22 grams of strontium chlorate***, and then blend the entire mixture on moderate speed, using a motorized stirrer in the usual means, for about 1 hour at room temperature. After 1 hour, spread the pasty mass onto a shallow pan or tray, and allow it to thoroughly air-dry. The dried mass can then be pulverized using a ball mill in the usual manner, and then pressed. Note: sparklers or other similar devices can be prepared by coating the pasty mass, before it dries, onto any desirable and suitable surface such a metal rod, wood, ect., or any other desirable material, and then allowed to cure.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% strontium nitrate, 20% shellac, 12% resin, 7.9% potassium chlorate, 7.9% flour, 7.9% glass, 3.9% strontium chlorate, 0.40% mixed residues***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for many purposes including signal flares, lights, cones, sparklers, and many other similar devices.

07-05-008A: Brilliant reddish bengal light composition:

Into a suitable beaker, or similar container, place 750 milliliters of 99% isopropyl alcohol, and then add ***200 grams of shellac***, followed by ***600 grams of strontium nitrate***, followed by ***150 grams of potassium chlorate***, and then blend the entire mixture on moderate speed, using a motorized stirrer in the usual means, for about 30 minutes while raising the temperature of the mixture to about 90 Celsius. Afterwards, press the pasty mass into pre fabricated brass molds of any desirable shape or size, and then allow the mixture to cure for several days or more. Note: the brass molds should be coated with Vaseline before pressing the mixture there into.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63.1% strontium nitrate, 21% shellac, 15.7% potassium chlorate, 0.20% mixed residues***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for many purposes including signal flares, lights, cones, sparklers, and many other similar devices.

07-05-009A: Bengal light composition for matchsticks:

Into a suitable beaker or other container, place 250 milliliters of benzene, and then add and dissolve 10 grams of stearin. Thereafter, add in ***60 grams of steel chips*** ranging from 1 to 3 millimeters in length, and then blend the mixture using a spatula or similar utensil for a few minutes. Thereafter, the steel chips will be coated with the desired stearin. Thereafter, filter-off the steel chips, and then allow them to air-dry. Now, into a suitable empty ball mill, place the dried steel chips, followed by ***450 grams of lead nitrate***, followed by ***60 grams of standard wood charcoal***, and then tumble the mixture at 150 to 200 RPM for about 30 to 40 minutes to form a uniform mixture. Thereafter, place this tumbled mixture into a clean beaker or similar container, and then add in a shellac solution prepared by adding and dissolving 10 grams of shellac into 95% ethyl alcohol. Thereafter, blend the mixture for about 10 minutes.

After 10 minutes, the mixture is ready for use. To use, dip wood or metal sticks or rods into the blended mixture, multiple times, allowing the stick or rod to thoroughly dry before re-dipping. Perform this operation as many times as necessary as based on the desired thickness of the composition on your stick or rods. The mixture can also be cast into any desirable shape, by filtering-off the mass, and then pressing it in the usual manner
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***78.9% lead nitrate, 10.5% wood charcoal, 10.5% steel chips, 0.10% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in cones, flares, but primarily for making Bengal light matchsticks.

07-05-010A: Standard fountain composition:

Into a suitable container, place ***225 grams of barium nitrate***, followed by ***25 grams of coarse meal powder***. Thereafter, gently blend the mixture using a plastic spatula or equivalent for about 10 minutes. Thereafter, add in 50 milliliters of acetone, followed by ***25 grams of potassium nitrate***, and then followed by ***225 grams of aluminum powder*** of average commercial availability. Thereafter blend the mixture until some of the acetone evaporates. Thereafter, the moist mixture is ready for use. To use, it simply needs to be pressed into any desirable cone or fountain device in the usual manner, and then allowed to thoroughly dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½ (steady burn)
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% barium nitrate, 45% aluminum powder, 5% meal powder, 5% potassium nitrate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in cones and fountains. Can also be used in Bengal lights.

07-05-011A: Standard fountain composition:

Into a ball mill, filled with 250 grams of Teflon coated steel shot ranging from 5 to 10 millimeters in diameter, place ***250 grams of potassium nitrate***, followed by ***50 grams of fine grained soft wood charcoal,*** and then followed by ***75 grams of flours of sulfur.*** Thereafter, tumble the mixture at about 100 to 200 RPM for about 1 hour to form a finely mixed material. Thereafter, add in ***125 grams of medium coarse iron powder***, and then continue to tumble the mixture for about 10 to 15 minutes. Finally, add in ***125 grams of fine grain meal*** powder, and then continue to blend the mixture for about 30 minutes. Now, place this mixture into a suitable container, and then moisten the mixture by adding in 150 milliliters of ether or acetone, and then blend the mixture for a few minutes to form a paste. Then, to use the mixture, it simply needs to be pressed into any desirable cone or fountain device in the usual manner, and then allowed to thoroughly dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½ (steady burn)
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% potassium nitrate, 40% meal powder, 12% sulfur, 8% wood charcoal***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in cones and fountains. Can also be used in Bengal lights.

07-05-011B: Standard fountain composition:

Into a ball mill, filled with 250 grams of Teflon coated steel shot ranging from 5 to 10 millimeters in diameter, place ***10 grams of potassium nitrate***, followed by ***205 grams of fine grained soft wood charcoal,*** and then followed by ***5 grams of flours of sulfur.*** Thereafter, tumble the mixture at about 100 to 200 RPM for about 1 hour to form a finely mixed material. Thereafter, add in ***10 grams of medium coarse iron powder***, and then continue to tumble the mixture for about 10 to 15 minutes. Finally, add in ***30 grams of fine grain meal*** powder, and then continue to blend the mixture for about 30 minutes. Now, place this mixture into a suitable container, and then moisten the mixture by adding in 125 milliliters of ether or acetone, and then blend the mixture for a few minutes to form a paste. Then, to use the mixture, it simply needs to be pressed into any desirable cone or fountain device in the usual manner, and then allowed to thoroughly dry.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5 ½ (steady burn)

Ease of ignition (1 to 10): Average.

Tendency to cake: None.

Explosive ability: None.

Percentage: ***79% soft wood charcoal, 11.5% meal powder, 3.8% potassium nitrate, 3.8% coarse iron, 1.9% sulfur***

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used in cones and fountains. Can also be used in Bengal lights.

07-05-011C: Standard fountain composition:

Into a ball mill, filled with 250 grams of Teflon coated steel shot ranging from 5 to 10 millimeters in diameter, place ***80 grams of potassium nitrate***, followed by ***30 grams of meal flour,*** and then followed by ***30 grams of flours of sulfur.*** Thereafter, tumble the mixture at about 100 to 200 RPM for about 1 hour to form a finely mixed material. Thereafter, place the tumbled mixture into a suitable mixing drum or equivalent, equipped with motorized stirrer, and then add in ***10 grams of antimony trisulfide,*** and then followed by 150 milliliters of acetone, and then blend the mixture for about 10 to 15 minutes to form a paste. Thereafter, the mixture is ready to use. To use, it simply needs to be pressed into any desirable cone or fountain device in the usual manner, and then allowed to thoroughly dry.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5 ½ (steady burn)

Ease of ignition (1 to 10): 6 ½

Tendency to cake: None.

Explosive ability: None.

Percentage: ***53% potassium nitrate, 20% sulfur, 20% meal flour, 6.6% antimony trisulfide, 0.4% residue balance***

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used in cones and fountains. Can also be used in Bengal lights.

07-05-011A: Classic fountain composition used in fireworks:

Into a suitable mixing drum or similar container, equipped with motorized stirrer in the usual means, place ***90 grams of antimony trisulfide***, followed by ***40 grams of dextrin***, followed by ***60 grams of sodium oxalate***, followed by ***400 grams of meal powder***, and then followed by 175 milliliters of hexane, and then blend the mixture for several hours to allow most of the solvent to evaporate. Thereafter, the mixture is ready for use in the usual means. To use, it simply needs to be pressed into any desired paper or cardboard tube, cone, ect, and then allowed to dry.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5 ½ (steady burn)

Ease of ignition (1 to 10): 6

Tendency to cake: None.

Explosive ability: None.

Percentage: ***67.79% meal powder, 15.25% antimony trisulfide, 10.16% sodium oxalate, 6.77% dextrin, 0.03% impurities***

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used in cones and fountains. Can also be used in Bengal lights and other similar devices.

07-05-012A: Classic blue fountain composition used in cones and fountains:

Into a suitable mixing drum or similar container, equipped with motorized stirrer in the usual means, place ***100 grams of stearin***, followed by ***25 grams of shellac***, followed by ***50 grams of copper-II-oxide***, and then add in 150 milliliters of acetone, and then blend the mixture for about 15 minutes. Thereafter, add in ***350 grams of ammonium perchlorate,*** and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and then allow it to thoroughly air-dry. Once it has, place the dry mass into a ball mill, filled with Teflon coated steel shot of the usual weight and diameter, and then tumble the mixture at 150 to 200 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready to use, to use, mix in a small amount of alcohol to form a mild paste, and then press this mass into any cone, fountain, ect, and then allow it to dry in the usual manner.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): Typical.

Ease of ignition (1 to 10): 6

Tendency to cake: None.

Explosive ability: None.

Percentage: ***66.66% ammonium perchlorate, 19% stearin, 9.5% copper-II-oxide, 4.76% shellac, 0.08% balance***

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used in cones and fountains.

07-05-013A: Classic Bengal light composition with improved burning rate:

Into a suitable mixing bowl or similar container, equipped with motorized stirrer in the usual means, place ***25 grams of di-butylphthalate***, followed by ***145 grams of fine grain iron powder***, followed by ***35 grams of aluminum powder of average mesh***, followed by ***85 grams of poly vinyl butyl rubber,*** and then followed by ***20 grams of ammonium nitrate.*** Thereafter, add in 150 milliliters of acetone, and then blend the mixture for about 15 to 20 minutes. Thereafter, add in ***190 grams of ammonium perchlorate***, and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, place the semi-pasty mass onto a shallow tray or pan, and then allow it to thoroughly air-dry. Once it has, place the dry mass into a ball mill, filled with Teflon coated steel shot of the usual weight and diameter, and then tumble the mixture at 150 to 200 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready to use, to use, mix in a small amount of alcohol to form a mild paste, and then press this mass into any cone, fountain, ect, and then allow it to dry in the usual manner.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): Typical.

Ease of ignition (1 to 10): 6

Tendency to cake: None.

Explosive ability: None.

Percentage: ***38% ammonium perchlorate, 29% iron powder, 17% poly vinyl butyl rubber, 7% aluminum, 5% di-butylphthalate, 4% ammonium nitrate catalyst***

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used in Bengal lights, and sparkler type devices.

07-05-014A: Classic Bengal light composition with improved intensity:

Into a suitable mixing bowl or similar container, equipped with motorized stirrer in the usual means, place ***25 grams of finely ground zirconium metal***, followed by ***115 grams of iron shot of 0.5 millimeters in diameter,*** followed by ***125 grams of fine grained iron powder***, followed by ***25 grams of aluminum powder,*** followed by ***36 grams of corn dextrin,*** and then followed by ***7.5 grams of potato starch.*** Thereafter, add in 175 milliliters of 95% ethyl alcohol, and then blend the mixture for about 15 to 20 minutes. Thereafter, add in ***172.5 grams of barium nitrate,*** and then continue to blend the mixture until the bulk of the alcohol evaporates. Thereafter, the pasty mass is ready for use. To use, the alcohol wet mass simply needs to be pressed into any desirable tube, mold, ect., and then allowed to dry, or coated on any suitable rod for making sparklers in the usual manner, and then allowed to dry.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 6

Ease of ignition (1 to 10): 6

Tendency to cake: None.

Explosive ability: None.

Percentage: ***38% ammonium perchlorate, 29% iron powder, 17% poly vinyl butyl rubber, 7% aluminum, 5% di-butylphthalate, 4% ammonium nitrate catalyst***

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used in Bengal lights, and sparkler type devices.

07-05-014B: Classic green Bengal light composition:

Into a suitable mixing bowl or similar container, equipped with motorized stirrer in the usual means, place ***10 grams of stearic acid***, followed by ***50 grams of shellac,*** followed by ***30 grams of potassium chlorate***, followed by ***115 grams of barium chlorate.*** Thereafter, add in 175 milliliters of 95% ethyl alcohol, and then blend the mixture for about 15 to 20 minutes. Thereafter, add in ***295 grams of barium nitrate,*** and then continue to blend the mixture until the bulk of the alcohol evaporates. Thereafter, the pasty mass is ready for use. To use, the alcohol wet mass simply needs to be pressed into any desirable tube, mold, ect., and then allowed to dry, or coated on any suitable rod for making sparklers in the usual manner, and then allowed to dry.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***59% barium nitrate, 23% barium chlorate, 10% shellac, 6% potassium chlorate, 2% stearic acid***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, and sparkler type devices.

07-05-015A: Classic blue Bengal light composition for use in blue lights:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer in the usual means, place ***75 grams of sulfur***, followed by ***75 grams of potassium sulfate,*** followed by ***75 grams of copper-II-ammonium sulfate***. Thereafter, add in 150 milliliters of hexane, and then blend the mixture for about 15 to 20 minutes. Thereafter, add in ***135 grams of potassium nitrate,*** followed by ***140 grams of potassium chlorate,*** and then continue to blend the mixture for about 15 to 30 minutes to form a uniform paste. Thereafter, the pasty mass is ready for use. To use, the alcohol wet mass simply needs to be pressed into any desirable tube, mold, ect., and then allowed to dry, or coated on any suitable rod for making sparklers in the usual manner, and then allowed to dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¼
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***28% potassium chlorate, 27% potassium nitrate, 15% sulfur, 15% potassium sulfate, 15% copper-II-ammonium sulfate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.

07-05-016A: Classic blue Bengal light composition for use in blue fires:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer in the usual means, place ***100 grams of mercury-I-chloride***, followed by ***200 grams of potassium sulfate,*** followed by ***125 grams of anhydrous copper-II- sulfate***, followed by ***150 grams of flours of sulfur,*** and thereafter add in, ***75 grams of shellac.*** Thereafter, add in 150 milliliters of ether, and then blend the mixture for about 15 to 20 minutes. Thereafter, add in ***200 grams of potassium chlorate,*** and then continue to blend the mixture for about 15 to 30 minutes to form a uniform paste. Thereafter, place the pasty mass onto a shallow pan or tray and allow it to thoroughly air-dry. Thereafter, place the mixture into a ball mill, filled with Teflon coated steel shot, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use, to use, simply moistened it with a little alcohol to form a paste. Thereafter, press the moistened mixture into any cone, fountain or mold in the usual manner, and then allow the munitions to thoroughly dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***23% potassium chlorate, 23%potassium sulfate, 18% sulfur, 15% copper-II-sulfate, 12% mercury-I-chloride, 9% shellac***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.

07-05-016B: Classic red Bengal light composition for use in red fires:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer in the usual means, place ***330 grams of strontium nitrate***, followed by ***125 grams of potassium chlorate,*** and then followed by ***45 grams of shellac***. Thereafter, add in 150 milliliters of ether, and then blend the mixture for about 15 to 20 minutes. Thereafter, place the blended mass onto a shallow pan or tray, and allow the mass to thoroughly dry. Thereafter, place the mixture into a ball mill, filled with Teflon coated steel shot, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use, to use, simply moisten it with a little alcohol to form a paste. Thereafter, press the moistened mixture into any cone, fountain or mold in the usual manner, and then allow the munitions to thoroughly dry.
Burn rate: Average.
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***66% strontium nitrate, 25% potassium chlorate, 9% shellac***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.

07-05-016C: Classic red Bengal light composition for use in red fires (fortified with kauri powder):
Into a suitable mixing bowl or similar container, equipped with motorized stirrer in the usual means, place ***200 grams of strontium nitrate***, followed by ***600 grams of potassium chlorate,*** followed by ***150 grams of strontium carbonate,*** and thereafter add in ***250 grams of Kauri powder***. Thereafter, add in 150 milliliters of ether, and then blend the mixture for about 15 to 20 minutes. Thereafter, place the blended mass onto a shallow pan or tray, and allow the mass to thoroughly dry. Thereafter, place the mixture into a ball mill, filled with Teflon coated steel shot, and then tumble the mixture at 200 RPM for about 1 hour to form a uniform powder. Thereafter, the powder is ready for use, to use, simply moisten it with a little alcohol to form a paste. Thereafter, press the moistened mixture into any cone, fountain or mold in the usual manner, and then allow the munitions to thoroughly dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium chlorate, 21% Kauri powder, 17% strontium nitrate, 12% strontium nitrate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.

07-05-016D: Classic red Bengal light composition for use in red fires:
Into a suitable beaker or similar container, place ***30 grams of standard Vaseline***, and then gently heat the Vaseline to melt it. Thereafter, add in ***40 grams of fine grain wood dust***, and then blend the mixture for about 10 minutes. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***2.5 grams of finely powdered Antimony***, followed by ***5 grams of powdered sugar***, followed by ***5 grams of "Colophonium"***, followed by ***55 grams of flours of sulfur***, followed by ***200 grams of strontium nitrate***, and then followed by ***45 grams of potassium perchlorate***. Thereafter, add in 150 milliliters of acetone, and then knead or blend the mixture for about 15 minutes. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into any desirable cone, fountain, mold, or coat any desirable material, and then allow the device(s) to thoroughly air-dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): Typical.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.28% strontium nitrate, 14.37% sulfur, 11.76% potassium perchlorate, 10.45% wood dust, 7.84% Vaseline, 1.3% sugar, 1.3% Colophonium, 0.65% antimony metal, 0.05% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.

07-05-016E: Classic red Bengal light composition for use in red fires:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual weight and diameter, place ***200 grams of mercury-I-chloride***, followed by ***125 grams of flours of sulfur***, followed by ***50 grams of shellac***, and then followed by ***50 grams of charcoal***. Thereafter, tumble the mixture for about 1 hour at 250 RPM. Thereafter, into a suitable beaker or similar container, equipped with motorized stirrer, place the tumbled mixture, followed by ***650 grams of potassium chlorate***, and then followed by ***200 grams of strontium nitrate***. Thereafter, add in 150 milliliters of acetone, and then knead or blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into any desirable cone, fountain, mold, or coat any desirable material, and then allow the device(s) to thoroughly air-dry in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): Typical.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50.98% potassium chlorate, 15.68% strontium nitrate, 15.68% mercury-I-chloride, 9.8% sulfur, 3.9% shellac, 3.9% charcoal, 0.06% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.

07-05-017A: Classic green Bengal light composition for use in green fires:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual weight and diameter, place ***150 grams of barium nitrate***, followed by ***400 grams of potassium chlorate***, and then followed by ***150 grams of flours of sulfur***, and then tumble the mixture for about 1 hour at 250 RPM. Thereafter, into a suitable beaker or similar container, equipped with motorized stirrer, place the tumbled mixture there into, followed by 150 milliliters of acetone, and then knead or blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into any desirable cone, fountain, mold, or coat any desirable material, and then allow the device(s) to thoroughly air-dry in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): Typical.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***57% potassium chlorate, 21% sulfur, 21% barium nitrate, 1% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.

07-05-017B: Classic green Bengal light composition for use in green fires:
Into a suitable beaker or similar container, equipped with motorized stirrer, place the tumbled mixture there into, followed by 150 milliliters of acetone, and then add in ***60 grams of mercury-I-chloride***, followed by ***30 grams of finely divided soft wood charcoal***, followed by ***30 grams of shellac***, followed by ***90 grams of flours of sulfur***, and then blend the mixture for about 10 to 15 minutes. Thereafter, add in ***360 grams of barium nitrate***, and then followed by ***180 grams of potassium chlorate***, and then continue to blend the mixture until the bulk of the acetone evaporates. Thereafter, the mixture is ready for use. To do so, simply press the mixture into any desirable cone, fountain, mold, or coat any desirable material, and then allow the mixture to thoroughly air-dry in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48% barium nitrate, 24% potassium chlorate, 12% sulfur, 8% mercury-I-chloride, 4% wood charcoal, 4% shellac***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses in the usual manner.

07-05-018A: Classic Bengal light composition for use in white fires:
Into a ball mill, filled with 250 grams of Teflon coated steel shot of small diameter, but average weight, place ***350 grams of potassium nitrate***, followed by ***100 grams of flours of sulfur***, followed by ***50 grams of powdered antimony***, and then tumble the mixture at 150 RPM for about 30 minutes at room temperature to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply moisten the mixture with a small amount of alcohol to form a paste. Thereafter, press the mixture into any cone, fountain, mold, ect., in the usual manner, and then allow the munitions to cure until thoroughly dry. Can be ignited using ant standard means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% potassium nitrate, 20% sulfur, 10% antimony***

Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses in the usual manner.

07-05-019A: Classic Bengal light composition for use in yellow fires:
Into a ball mill, filled with 250 grams of Teflon coated steel shot of small diameter, but average weight, place ***100 grams of potassium chlorate***, followed by ***40 grams of sodium oxalate***, followed by ***20 grams of potassium nitrate***, followed by ***40 grams of fine grained wood charcoal***, and then followed by ***20 grams of flours of sulfur***. Thereafter, tumble the mixture at 150 RPM for about 30 minutes at room temperature to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply moisten the mixture with a small amount of alcohol to form a paste. Thereafter, press the mixture into any cone, fountain, mold, ect., in the usual manner, and then allow the munitions to cure until thoroughly dry. Can be ignited using ant standard means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% potassium chlorate, 18% sodium oxalate, 18% wood charcoal, 9% potassium nitrate, 9% sulfur, 1% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in display fires for multiple uses.

07-05-019B: Classic Bengal light composition for use in yellow fires:
Into a ball mill, filled with 250 grams of Teflon coated steel shot of small diameter, but average weight, place ***180 grams of potassium chlorate***, followed by ***60 grams of sodium oxalate***, followed by ***60 grams of flours of sulfur***, and then followed by ***30 grams of shellac***. Thereafter, tumble the mixture at 150 RPM for about 30 minutes at room temperature to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply moistened the mixture with a small amount of alcohol to form a paste. Thereafter, press the mixture into any cone, fountain, mold, ect., in the usual manner, and then allow the munitions to cure until thoroughly dry. Can be ignited using ant standard means.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54% potassium chlorate, 18% sodium oxalate, 18% sulfur, 9% shellac, 1% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in display fires for multiple uses.

07-05-020A: Classic Bengal light composition for use in purple fires:
Into a suitable mixing drum, or bowl, equipped with a motorized stirrer in the usual means, place ***100 grams of copper sulfate*** (anhydrous), followed by ***100 grams of potassium chlorate***, and then followed by ***100 grams of flours of sulfur***. Thereafter, add in about 150 milliliters of acetone or ether, and then blend the mixture for about 15 minutes to form a paste. Thereafter, allow some of the solvent to evaporate, and then blend the mixture for another 5 minutes. Thereafter, the mixture is ready to use. To use, the moistened mixture simply needs to be pressed into any cone, fountain, mold, or any suitable tube, body, ect, in the usual manner, and then the devices need to be thoroughly dried at room temperature, or in an oven at low heat.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): Average.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.33% potassium chlorate, 33.33% anhydrous copper sulfate, 33.33% sulfur, 0.01% mixed***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in display fires for multiple uses.

07-05-021A: Classic sparkler composition:
Into a suitable mixing drum, or bowl, equipped with a motorized stirrer in the usual means, place ***40 grams of guar gum***, followed by ***360 grams of dextrin***, and then followed by ***800 grams of mild fine grained titanium powder***. Thereafter, add in about 250 milliliters

of 95% ethyl alcohol, and then blend the mixture for about 15 minutes to form a paste. Thereafter, add in ***800 grams of potassium perchlorate,*** and then continue to blend the mixture for about 30 minutes. Thereafter, the mixture is ready to use. To use, the mild paste simply needs to be evenly coated onto any length of steel rod. The rods can be anywhere from 3 to 5 milliliters in diameter. Thereafter, the sparklers should allowed do in an oven at low temperature. The mixture can also be pressed into cone, fountains, tubes, ect., in the usual means. The mixture in either case, should be ignited using any standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% titanium powder, 40% potassium perchlorate, 18% dextrin, 2% guar gum***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in sparkler compositions. Can also be used in other fireworks for generating a beautiful shower of sparks.

07-05-021B: Classic sparkler composition with spectacular visual effect:
Into a suitable mixing drum, or bowl, equipped with a motorized stirrer in the usual means, place ***200 grams of finely powdered charcoal***, followed by ***200 grams of a fine grained alloy containing 50% magnesium and 50% aluminum***, followed by ***300 grams of low grained iron powder***. Thereafter, add in about 250 milliliters of hexane, and then blend the mixture for about 15 minutes to form a paste. Thereafter, add in ***200 grams of nitroguanidine,*** followed by ***100 grams of potassium nitrate,*** and then continue to blend the mixture for about 30 minutes. Thereafter, place the mixture onto a shallow pan, and allow the mixture to thoroughly air-dry. Thereafter, the dried mass needs to be pulverized into a fine powder using a ball mill or similar device. Once the mixture has been pulverized, it's for use. To use, the mixture needs to be formed into a paste by mixing in a little hexane. Thereafter, it can be evenly coated onto any length of steel rod. The rods can be anywhere from 3 to 5 milliliters in diameter. Thereafter, the sparklers should be allowed to dry in an oven at low temperature. The mixture can also be pressed into cones, fountains, tubes, ect., in the usual means. The mixture in either case, should be ignited using any standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% iron powder, 20% charcoal, 20% magnesium/aluminum alloy, 20% nitroguanidine, 10% potassium nitrate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in sparkler compositions. Can also be used in other fireworks for generating a beautiful shower of sparks.

07-05-022A: Classic basic sparkler composition with spectacular visual effect:
Into a suitable mixing drum, or bowl, equipped with a motorized stirrer in the usual means, place ***150 grams of shellac***, followed by ***1200 grams of fine grained aluminum***, and then followed by ***800 grams of barium chlorate***. Thereafter, add in about 275 milliliters of 95% ethyl alcohol, and then blend the mixture for about 30 minutes to form a good paste. Thereafter, the paste is ready for use. To use, the paste simply needs to be evenly coated onto any length of steel rod. The rods can be anywhere from 3 to 5 milliliters in diameter. Thereafter, the sparklers should be allowed to dry in an oven at low temperature. The paste can also be pressed into any cone, fountain, tube, ect., in the usual manner. The mixture in either case, should be ignited using any standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55.8% grained aluminum, 37% barium chlorate, 6.97% shellac, 0.23% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in sparkler compositions. Can also be used in other fireworks for generating a beautiful shower of sparks.

07-05-023A: Classic basic sparkler composition with visual effect using black powder base:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot of 10 millimeters in diameter, and then add in ***280 grams of potassium nitrate***, followed by ***80 grams of fours of sulfur***, followed by ***160 grams of soft wood charcoal***, and then followed by ***120 grams of medium grained aluminum***, and then tumble the mixture at 200 RPM for about 30 minutes to form a uniform powder.

Thereafter, remove the tumbled mixture from the ball mill, minus the steel shot, and place into a suitable mixing bowl. Thereafter, add in about 75 to 100 milliliters of alcohol, and then blend the mixture to form a paste. Thereafter, the mixture is ready for use. To use, the mixture simply needs to evenly coated on any metal rod and then allowed to cure. As before, the mixture, if desired, can be pressed into any tube, container, mold, ect., in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***43.75% potassium nitrate, 25% soft wood charcoal, 18.75% aluminum, 12.5% sulfur***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in sparkler compositions. Can also be used in other fireworks for generating a beautiful shower of white sparks.

07-05-023B: Classic basic sparkler composition with visual effect using black powder base (modified):
Into a suitable ball mill, filled with 250 grams of Teflon coated steels shot of 10 millimeters in diameter, and then add in ***280 grams of potassium nitrate***, followed by ***60 grams of fours of sulfur***, followed by ***60 grams of soft wood charcoal***, followed by ***40 grams of medium grained aluminum***, and then tumble the mixture for about 30 minutes at 200 RPM. Thereafter, remove the dry tumbled mixture, and place it into a suitable mixing drum or bowl, equipped with motorized stirrer, and then add in ***10 grams of standard epoxy resin,*** and then blend the mixture for about 10 minutes. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be evenly coated on any metal rod and then allowed to cure. As before, the mixture, if desired, can be pressed into any tube, container, mold, ect., in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***62.2% potassium nitrate, 13.3% soft wood charcoal, 13.3% sulfur, 8.8% aluminum, 2.4% epoxy resin (such Epon 815)***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in sparkler compositions. Can also be used in other fireworks for generating a beautiful shower of white sparks.

07-05-024A: Brilliant spark producing fire composition for use in sparklers or other spark emitting devices:
Into a suitable mixing bowl, blender, ect. equipped with motorized stirrer, place ***30 grams of dextrin***, followed by ***235 grams of finely divided titanium powder***, and then followed by ***235 grams of potassium perchlorate***. Thereafter, add in 100 milliliters of ether, and then blend the mixture for about 30 minutes to form a paste. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into any container, tube, mold, ect., in the usual manner. Note: do not seal into enclosed space, as ignition could cause an explosion.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47% titanium powder, 47% potassium perchlorate, 6% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in firework devices for generating a beautiful shower of white sparks. Can be used in sparklers, but take caution as the burn rate is much faster then normal.

07-05-025A: Brilliant golden spark producing composition for use in fountains and/or stars:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual weight and diameter, place ***50 grams of finely divided lampblack***, followed by ***80 grams of finely powdered sulfur***, and then followed by ***180 grams of potassium nitrate***. Thereafter, tumble the mixture for about 1 hour at 150 RPM to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be wetted using a small amount of alcohol to form a paste, and then the mixture needs to be pressed into any desirable cone, fountain, tube, mold, or container, in the usual means, and then allowed to cure.
Burn rate: Above average.
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58% potassium nitrate, 25.8% sulfur, 16% lamp black, 0.2% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in firework devices for generating a beautiful shower of "golden rain".

07-05-025B: Brilliant golden spark producing composition for use in fountains and/or stars:
Into a suitable ball mill, filled with Teflon coated steel shot of the usual weight and diameter, place ***40 grams of finely divided sulfur***, followed by ***200 grams of finely powdered potassium nitrate***, followed by ***40 grams of finely divided lampblack***, and then followed by ***140 grams of fine iron fillings*** (factory flour grade). Thereafter, tumble the mixture for about 1 hour at 150 RPM to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be wetted using a small amount of alcohol to form a paste, and then the mixture needs to be pressed into any desirable cone, fountain, tube, mold, or container, in the usual means, and then allowed to cure.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***47.61% potassium nitrate, 33.33% iron fillings, 9.5% lampblack, 9.5% sulfur, 0.06% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in firework devices for generating a beautiful shower of "golden rain".

07-05-026A: Brilliant "Japanese sparkler" composition for use in fountains and sparklers:
Into a suitable mixing bowl, blender, ect, equipped with motorized stirrer in the usual manner, place ***600 grams of potassium nitrate***, followed by ***200 grams of fire soot*** (obtained from a fireplace), and then followed by ***300 grams of flours of sulfur***. Thereafter, add in 250 milliliters of hexane, and then blend the mixture for about 30 minutes to form a paste. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into any container, tube, mold, ect., in the usual manner, or coated onto any metal rod or similar, and then allowed to dry.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54.54% potassium nitrate, 27.27% sulfur, 18.18% soot, 0.01% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in Senko Hanabi firework devices for generating a beautiful shower of sparks.

07-05-026B: Brilliant "Japanese sparkler" composition for use in fountains and sparklers:
Into a suitable mixing bowl, blender, ect, equipped with motorized stirrer in the usual manner, place ***450 grams of finely grained realgar mineral***, followed by ***200 grams of fire soot*** (obtained from a fireplace), and then followed by ***350 grams of potassium nitrate***. Thereafter, add in 175 milliliters of hexane, and then blend the mixture for about 30 minutes to form a paste. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into any container, tube, mold, ect., in the usual manner, or coated onto any metal rod or similar, and then allowed to dry.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***45% realgar mineral, 35% potassium nitrate, 20% soot***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in Senko Hanabi firework devices for generating a beautiful shower of sparks.

07-05-027A: Brilliant fountain composition for use in fountains:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***350 grams of potassium nitrate***, and then followed by ***350 grams of soft wood charcoal***. Thereafter, tumble the mixture at 350 RPM for about 1 hour. Thereafter, place the tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 400 milliliters of hexane, and then followed by ***3600 grams of meal powder***, followed by ***350 grams of "dark grade" aluminum***, and then followed by ***350 grams of 120 mesh aluminum powder***. Thereafter, add in 400 milliliters of acetone, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable container, cone, fountain, tube, ect., in any desired fashion, and then allow the devices to cure in an oven at moderate temperature in the usual manner. Note: the mixture should be pressed at high pressure.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72% meal powder, 7% charcoal, 7% potassium nitrate, 7% dark aluminum, 7% aluminum***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.

07-05-028A: Brilliant fountain composition for use in fountains:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, place ***1400 grams of black powder***, and then followed by ***80 grams of soft wood charcoal***. Thereafter, tumble the mixture at 350 RPM for about 1 hour. Thereafter, place the tumbled mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 400 milliliters of hexane, and then followed by ***520 grams of meal powder***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable container, cone, fountain, tube, ect., in any desired fashion, and then allow the devices to cure in an oven at moderate temperature in the usual manner. Note: the mixture should be pressed at high pressure.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% black powder, 26% meal powder, 4% charcoal***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.

07-05-029A: Brilliant fountain composition for use in fountains:
Into a suitable mixing container, equipped with motorized stirrer, place ***1200 grams of potassium nitrate***, followed by ***200 grams of soft wood charcoal***, and then followed by 300 milliliters of 95% ethyl alcohol, and then blend the mixture on high for about 30 minutes. Thereafter, add in ***500 grams of coarse iron powder***, and then followed by ***200 grams of powdered sulfur***, and the continue to blend the mixture for about 45 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable container, cone, fountain, tube, ect., in any desired fashion, and then allow the devices to cure in an oven at moderate temperature in the usual manner. Note: the mixture should be pressed at high pressure.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***57.14% potassium nitrate, 23.8% coarse iron powder, 9.52% wood charcoal, 9.52% sulfur, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.

07-05-029B: Brilliant fountain composition for use in fountains:

Into a suitable mixing container, equipped with motorized stirrer, place ***200 grams of potassium nitrate***, followed by ***400 grams of soft wood charcoal***, and then followed by 200 milliliters of 95% ethyl alcohol, and then blend the mixture on high for about 30 minutes. Thereafter, add in ***200 grams of coarse iron powder***, and then followed by ***400 grams of meal powder***, and then continue to blend the mixture for about 45 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable container, cone, fountain, tube, ect., in any desired fashion, and then allow the devices to cure in an oven at moderate temperature in the usual manner. Note: the mixture should be pressed at high pressure.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***33.33% soft wood charcoal, 33.33% meal powder, 16.66% potassium nitrate, 16.66% coarse iron powder, 0.02% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.

07-05-030A: Brilliant fountain composition for use in fountains and other purposes:
Into a suitable empty ball mill, place ***400 grams of antimony trisulfide***, followed by ***200 grams of aluminum powder***, and then followed by ***2000 grams of meal powder***. Thereafter, tumble the mixture at 500 RPM for about 2 hours. Thereafter, place this tumbled mixture into a suitable mixing bowl, and then add in 400 milliliters of 99% isopropyl alcohol, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure into any desirable container, tube, cone, fountain, ect., in the usual manner, and then cure at room temperature or in an oven at moderate temperature in the usual manner. Prime with the usual primer.
Burn rate: Below normal.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***76.92% meal powder, 15.38% antimony trisulfide, 7.69% aluminum, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.

07-05-031A: Brilliant fountain composition for use in fountains and other purposes:
Into a suitable empty ball mill, place ***150 grams of potassium nitrate***, followed by ***50 grams of aluminum powder***, followed by ***50 grams of soft wood charcoal***, followed by ***50 grams of sulfur***, and then followed by ***100 grams of meal powder***. Thereafter, tumble the mixture at 500 RPM for about 2 hours. Thereafter, place this tumbled mixture into a suitable mixing bowl, and then add in 75 milliliters of 99% isopropyl alcohol, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure into any desirable container, tube, cone, fountain, ect., in the usual manner, and then cure at room temperature or in an oven at moderate temperature in the usual manner. Prime with the usual primer.
Burn rate: Below normal.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***37.5% potassium nitrate, 25% meal powder, 12.5% sulfur, 12.5% charcoal, 12.5% aluminum powder***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.

07-05-032A: Fountain composition for use in fountains and other purposes:
Into a suitable empty ball mill, place ***200 grams of coarse steel or iron flake***, and then followed by 15 milliliters of linseed oil. Thereafter, tumble the mixture at 150 RPM for about 15 minutes to coat the flakes. Thereafter, add in ***100 grams of soft pine wood charcoal***, and then followed by ***400 grams of meal powder***. Thereafter, tumble the mixture at 500 RPM for about 2 hours. Thereafter, place this tumbled mixture into a suitable mixing bowl, and then add in 100 milliliters of acetone, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure

into any desirable container, tube, cone, fountain, ect., in the usual manner, and then cure at room temperature or in an oven at moderate temperature in the usual manner. Prime with the usual primer.
Burn rate: Below normal.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***57.14% meal powder, 28.57% iron flake, 14.28% pine wood charcoal, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.

07-05-033A: Beautiful green "Bengal fire" composition for multiple purposes:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 500 milliliters of tetrahydrofuran, and add in ***200 grams of PVC***, followed by ***1600 grams of barium nitrate***, and then followed by ***200 grams of red gum***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter, add in 400 milliliters of ice water, and then continue to blend the mixture for about 5 minutes. Thereafter, filter-off the insoluble mass, and then vacuum dry or air-dry it in the usual manner until a paste is obtained. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable material for any desired purposes. Prime in the usual manner.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% barium nitrate, 10% red gum, 10% PVC***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-034A: Beautiful green "Bengal fire" composition for multiple purposes:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 350 milliliters of hexane, and then add in ***600 grams of barium nitrate***, followed by ***300 grams of potassium nitrate***, and then followed by ***200 grams of sulfur***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter, add in 150 milliliters of ice water, and then continue to blend the mixture for about 5 minutes. Thereafter, filter-off the insoluble mass, and then vacuum dry or air-dry it in the usual manner until a paste is obtained. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable material for any desired purposes. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***54.54% barium nitrate, 27.27% potassium nitrate, 18.18% sulfur, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-035A: Beautiful blue "Bengal fire" composition for multiple purposes:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 350 milliliters of hexane, and then add in ***600 grams of potassium chlorate***, followed by ***800 grams of copper ammonium sulfate***, followed by ***200 grams of ground willow charcoal***, and then followed by ***100 grams of shellac***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable material for any desired purposes. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+

Tendency to cake: None.
Explosive ability: None.
Percentage: *47.05% copper ammonium sulfate, 35.29% potassium chlorate, 11.76% willow charcoal, 5.88% shellac, 0.02% mixed balance*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-035B: Beautiful blue "Bengal fire" composition for multiple purposes:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 400 milliliters of 95% ethyl alcohol, and then add in ***1200 grams of potassium perchlorate***, followed by ***250 grams of copper ammonium chloride***, followed by ***100 grams of ground stearin***, and then followed by ***50 grams of asphaltum***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable material for any desired purposes. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: *75% potassium perchlorate, 15.625% copper ammonium chloride, 6.25% ground stearin, 3.125% asphaltum*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-035C: Beautiful blue "Bengal fire" composition for multiple purposes:
As in the previous example, into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 550 milliliters of acetone, and then add in ***200 grams of copper-II-sulfide***, followed by ***400 grams of sulfur***, and then followed by ***700 grams of finely ground potassium chlorate***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and then allow the mixture to fully evaporate. Note: an oven or vacuum can be used to speed up the process. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable container, firework, ect under high pressure for any desired purposes. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *53.84% potassium chlorate, 30.76% sulfur, 15.38% copper-II-sulfide, 0.02% mixed balance*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes

07-05-035D: Beautiful blue "Bengal fire" composition for multiple purposes:
As in the previous example, into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 550 milliliters of acetone, and then add in ***500 grams of potassium nitrate***, followed by ***500 grams of powdered charcoal***, followed by ***500 grams of mercury-II-chloride***, and then followed by ***500 grams of copper-II-oxide***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and then allow the mixture to fully evaporate. Note: an oven or vacuum can be used to speed up the process. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable container, firework, ect under high pressure for any desired purposes. Prime in the usual manner.
Burn rate: Low.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 4 (depends on pressing pressure).
Tendency to cake: None.
Explosive ability: None.
Percentage: *25% potassium nitrate, 25% charcoal, 25% mercury-II-chloride, 25% copper-II-oxide*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-036A: Beautiful blue "Bengal fire" composition for multiple purposes (modified):
As in the previous example, into a suitable mixing bowl or similar container, equipped with motorized stirrer, place 500 milliliters of hexane, and then add in ***1200 grams of potassium nitrate***, followed by ***400 grams of powdered sulfur***, and then followed by ***200 grams of antimony trisulfide***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and then allow the mixture to fully evaporate. Note: an oven or vacuum can be used to speed up the process. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable container, firework, ect under high pressure for any desired purposes in the usual manner. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: *66.66% potassium nitrate, 22.22% sulfur, 11.11% antimony trisulfide, 0.01% mixed residual balance*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-036B: Beautiful blue "Bengal fire" composition for multiple purposes (modified):
Into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***750 grams of potassium nitrate***, and then followed by ***700 grams of potassium sulfate***. Thereafter, tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl or similar container, equipped with motorized stirrer, and then add in about 600 milliliters of hexane, and then add in ***700 grams of sulfur***, and then followed by ***1400 grams of potassium chlorate***. Thereafter, blend the mixture on high speed for about 30 minutes. Thereafter, place the mixture onto a shallow pan or tray, and then allow the mixture to fully evaporate. Note: an oven or vacuum can be used to speed up the process. Thereafter the mixture is ready for use. To use, simply press the mixture into any desirable container, firework, ect under high pressure for any desired purposes in the usual manner. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: *39.43% potassium chlorate, 21.12% potassium nitrate, 19.71% potassium sulfate, 19.71% sulfur, 0.03% residual residue*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-037A: Typical red "fire" composition with multiple uses:
Into a suitable mixing bowl, in the typical fashion, equipped with motorized stirrer, place 1500 milliliters of 95% ethyl alcohol, and then add in ***1200 grams of shellac***, followed by ***1600 grams of strontium carbonate***, and then followed by ***7200 grams of potassium chlorate***. Thereafter, blend the mixture on moderate speed for about 50 minutes. Thereafter, place the mixture into an oven or vacuum and allow the solvent to evaporate. Thereafter, place the dried material into a suitable ball mill, filled with 1500 grams of Teflon coated steel shot of the usual diameter, and then tumble the mixture at 500 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be moistened with solvent and then rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means. Priming may or may not be needed.
Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: *72% potassium chlorate, 16% strontium carbonate, 12% shellac*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-037B: Typical red "fire" composition with multiple uses:

Into a suitable mixing bowl, in the typical fashion, equipped with motorized stirrer, place 150 milliliters of hexane, and then add in ***400 grams of potassium chlorate***, and then followed by ***200 grams of charcoal***, and then blend the mixture for about 40 minutes on high speed. Thereafter, add in 350 milliliters of additional hexane, followed by ***1000 grams of strontium nitrate***, and then followed by ***200 grams of flours of sulfur***. Thereafter, blend the mixture on moderate speed for about 50 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be formed into any desired shape, or rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means, and then the material needs to be cured in an oven in the usual means. Note: avoid excessive heat during curing. Priming may or may not be needed.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55.55% strontium nitrate, 22.22% potassium chlorate, 11.11% charcoal, 11.11% sulfur, 0.01% residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-037C: Typical red "fire" composition with multiple uses:
Into a suitable mixing bowl, in the typical fashion, equipped with motorized stirrer, place 150 milliliters of hexane, and then add in ***200 grams of potassium chlorate***, and then followed by ***200 grams of charcoal***, and then blend the mixture for about 40 minutes on high speed. Thereafter, add in 900 milliliters of additional hexane, followed by ***2200 grams of strontium nitrate***, followed by ***2200 grams of calcium carbonate***, and then followed by ***800 grams of flours of sulfur***. Thereafter, blend the mixture on moderate speed for about 50 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be formed into any desired shape, or rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means, and then the material needs to be cured in an oven in the usual means. Note: avoid excessive heat during curing. Priming may or may not be needed.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.28% strontium nitrate, 39.28% calcium carbonate, 14.28% sulfur, 3.57% potassium chlorate, 3.57% charcoal, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-037D: Typical red "fire" composition with multiple uses:
As in the previous example, into a suitable mixing bowl, in the typical fashion, equipped with motorized stirrer, place 900 milliliters of ethyl acetate, and then add in ***2900 grams of potassium chlorate***, followed by ***500 grams of "orange" shellac product***, and then followed by ***600 grams of strontium carbonate***. Thereafter, blend the mixture on moderate speed for about 50 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be formed into any desired shape, or rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means, and then the material needs to be cured in an oven in the usual means. Priming may or may not be needed.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Above normal.
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.5% potassium chlorate, 15% strontium carbonate, 12.5% orange shellac product***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-037E: Simple red "fire" composition with multiple uses:

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, in the usual diameter, place ***800 grams of strontium nitrate***, and then followed by ***200 grams of "orange" shellac product***. Thereafter, add in 150 milliliters of acetone, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of acetone, and then blend the mixture on high for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be formed into any desired shape, or rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means, and then the material needs to be cured in an oven in the usual means. Priming may or may not be needed.
Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***80% strontium nitrate, 20% orange shellac***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-038A: Simple green "fire" composition with multiple uses:
Into a suitable mixing bowl, in the typical fashion, equipped with motorized stirrer, place 450 milliliters of hexane, and then add in ***400 grams of sulfur***, followed by ***600 grams of potassium chlorate***, and then followed by ***1400 grams of barium nitrate***. Thereafter, blend the mixture on moderate speed for about 50 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be formed into any desired shape, or rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means, and then the material needs to be cured in an oven in the usual means. Priming may or may not be needed.
Burn rate: Low.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.33% barium nitrate, 25% potassium chlorate, 16.66% sulfur, 0.01% residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-038B: Simple green "fire" composition with white glare:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, in the usual diameter, place ***600 grams of barium nitrate***, followed by ***800 grams of potassium chlorate***, and then followed by ***200 grams of "orange" shellac product***. Thereafter, add in 75 milliliters of acetone, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of acetone, and then blend the mixture on high for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be formed into any desired shape, or rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means, and then the material needs to be cured in an oven in the usual means. Priming may or may not be needed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium chlorate, 37.5% barium nitrate, 12.5% orange shellac product***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-039A: Typical white "fire" composition:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 900 milliliters of hexane, and then add in ***200 grams of fine pine wood charcoal***, followed by ***4800 grams of potassium nitrate***, and then followed by ***1400 grams of finely powdered sulfur***. Thereafter, blend the mixture on moderate speed for about 20 to 40 minutes. Thereafter, the mixture is ready for use.

To use, simply press the mixture into any desirable mold, container, tube, or any desired shape or form, and then cure in an oven at moderate temperature in the typical manner. Prime if needed.
Burn rate: Above normal.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% potassium nitrate, 21.875% sulfur, 3.125% pine wood charcoal***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-039B: Typical white "fire" composition:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 1500 milliliters of 95% ethyl alcohol, and then add in ***700 grams of sulfur***, followed by ***700 grams of potassium perchlorate***, followed by ***3400 grams of barium nitrate***, and then followed by ***1000 grams of finely powdered aluminum***. Thereafter, blend the mixture on moderate speed for about 40 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable mold, container, tube, or any desired shape or form, and then cure in an oven at moderate temperature in the typical manner. Prime if needed.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.62% barium nitrate, 17.24% aluminum powder, 12.06% sulfur, 12.06% potassium perchlorate, 0.02% mixed residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-039C: Typical white "fire" composition:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 550 milliliters of acetone, and then add in ***1200 grams of potassium nitrate***, followed by ***200 grams of sulfur***, and then followed by ***200 grams of antimony trisulfide***. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable mold, container, tube, or any desired shape or form, and then cure in an oven at moderate temperature in the typical manner. Prime if needed.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% potassium nitrate, 12.5% sulfur, 12.5% antimony trisulfide***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-039D: Typical white "fire" composition (modified formula):
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place 1500 milliliters of hexane, and then add in ***4800 grams of potassium nitrate***, followed by ***200 grams of sulfur***, and then followed by ***200 grams of finely powdered charcoal***. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable mold, container, tube, or any desired shape or form, and then cure in an oven at moderate temperature in the typical manner. Prime if needed.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6
Tendency to cake: None.

Explosive ability: None.
Percentage: ***92.3% potassium nitrate, 3.84% sulfur, 3.84% charcoal, 0.02% residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-040A: Standard yellow "fire" composition:
Into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***800 grams of potassium nitrate***, followed by ***200 grams of sulfur***, followed by ***400 grams of soft wood charcoal***, and then followed by ***600 grams of sodium chloride***. Thereafter, tumble the mixture at 300 RPM for about 1 hour. Thereafter, place the tumbled mixture into a suitable mixing bowl, or similar container, equipped with motorized stirrer, and then add in 400 milliliters of hexane, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable mold, container, tube, or any desired shape or form, and then cure in an oven at moderate temperature in the typical manner. Prime if needed.
Burn rate: Low.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% potassium nitrate, 30% sodium chloride, 20% soft wood charcoal, 10% sulfur***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-040B: Standard yellow "fire" composition:
Into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***600 grams of sodium carbonate (anhydrous)***, and then followed by ***1600 grams of potassium chlorate***. Thereafter, tumble the mixture at 300 RPM for about 1 hour. Thereafter, place the tumbled mixture into a suitable mixing bowl, or similar container, equipped with motorized stirrer, and then add in 400 milliliters of hexane, and then followed by ***400 grams of flours of sulfur***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable mold, container, tube, or any desired shape or form, and then cure in an oven at moderate temperature in the typical manner. Prime if needed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***61.53% potassium chlorate, 23.07% sodium carbonate, 15.38% sulfur, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-041A: Classic sparkler composition for different uses:
Into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, and then add in 400 milliliters of 95% ethyl alcohol, or any suitable solvent. Thereafter, add in ***700 grams of potassium nitrate***, followed by ***100 grams of aluminum flake***, followed by ***150 grams of flours of sulfur***, and then followed by ***150 grams of fine grain soft wood charcoal***. Thereafter, blend the mixture on moderate speed for about 40 minutes to form a uniform paste. Note: more or less solvent may be needed to form a uniform paste. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63.63% potassium nitrate, 13.63% sulfur, 13.63% charcoal, 9.09% aluminum flake, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-041B: Classic sparkler composition for different uses:

Into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, place 500 milliliters of 95% ethyl alcohol, or any suitable solvent. Thereafter, add in ***1200 grams of potassium perchlorate***, followed by ***200 grams of dextrin***, and then followed by ***600 grams of coarse aluminum flake***. Thereafter, blend the mixture on moderate speed for about 40 minutes to form a uniform paste. Note: more or less solvent may be needed to form a uniform paste. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% potassium perchlorate, 30% coarse aluminum flake, 10% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-041C: Classic sparkler composition for different uses:

Into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, place 500 milliliters of 95% ethyl alcohol, or any suitable solvent. Thereafter, add in ***1400 grams of potassium nitrate***, followed by ***200 grams of coarse aluminum flake,*** followed by ***300 grams of soft pine wood charcoal***, and then followed by ***300 grams of flours of sulfur***. Thereafter, blend the mixture on moderate speed for about 40 minutes to form a uniform paste. Note: more or less solvent may be needed to form a uniform paste. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63.63% potassium nitrate, 13.63% pine wood charcoal, 13.63% sulfur, 9.09% coarse aluminum flake, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-041D: Classic "reddish" sparkler composition for different uses:

Into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, and then add in 150 milliliters of 95% ethyl alcohol, or any suitable solvent. Thereafter, add in ***500 grams of strontium nitrate***, and then followed by ***100 grams of shellac.*** Thereafter, blend the mixture on moderate speed for about 15 minutes. Thereafter, add in 500 milliliters of ice water, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, filter-off the insoluble mass, and then vacuum dry it or air-dry it in the usual manner. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.

Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***83.33% strontium nitrate, 16.66% shellac, 0.01% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-041E: Classic "flash" sparkler composition for different uses:

Into a suitable ball mill, filled with 250 grams of heavy Teflon coated steel shot, place ***1000 grams of potassium perchlorate***, and then followed by ***300 grams of dextrin***. Thereafter, add in 75 milliliters of hexane, and then tumble the mixture at 300 RPM for about 15

minutes. Thereafter, place the mixture into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, and then add in 300 milliliters of hexane. Thereafter, add in ***700 grams of coarse aluminum flake***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.

Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium perchlorate, 35% coarse aluminum flake, 15% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-041F: Classic "flash" sparkler composition for different uses:

Into a suitable ball mill, filled with 250 grams of heavy Teflon coated steel shot, place ***800 grams of potassium perchlorate***, followed by ***40 grams of guar gum,*** and then followed by ***360 grams of dextrin***. Thereafter, add in 175 milliliters of hexane, and then tumble the mixture at 300 RPM for about 15 minutes. Thereafter, place the mixture into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, and then add in 400 milliliters of hexane. Thereafter, add in ***800 grams of coarse titanium fines***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.

Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40% potassium perchlorate, 40% coarse titanium fines, 18% dextrin, 2% guar gum***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-041G: Classic "green" sparkler composition for different uses:

Into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, place 500 milliliters of hexane. Thereafter, add in ***3000 grams of barium nitrate***, followed by ***600 grams of coarse aluminum fines***, and then followed by ***20 grams of pine wood charcoal***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.

Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***82.87% barium nitrate, 16.57% coarse aluminum fines, 0.55% charcoal, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-042A: Classic "red, white, & blue" sparkler composition:

Into a suitable ball mill, filled with 350 grams of heavy Teflon coated steel shot, ***place 200 grams of potassium perchlorate***, followed by ***300 grams of strontium nitrate***, followed by ***150 grams of dextrin.*** Thereafter, add in 75 milliliters of hexane, and then tumble the mixture at 300 RPM for about 15 minutes. Thereafter, place the mixture into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, and then add in 150 milliliters of hexane. Thereafter, add in ***175 grams of coarse aluminum fines***, followed by ***175 grams of coarse copper fines***, and then blend the mixture on moderate speed for about 30 minutes. Thereafter,

the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% strontium nitrate, 20% potassium perchlorate, 17.5% coarse aluminum fines, 17.5% coarse copper fines, 15% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-043A: Classic sparkler composition:
Into a suitable mixing bowl, equipped with motorized stirrer, place 300 milliliters of acetone, and then followed by ***150 grams of dextrin***, followed by ***500 grams of potassium perchlorate***, and then followed by ***350 grams of powdered aluminum***, and the blend the mixture on moderate speed for about 50 minutes. Thereafter, the mixture is ready for use. To use, simply coat any metal rod with any desired thickness, and then cure the sparklers in an oven at moderate temperature. If desired the mixture can be pressed into pellets or tablets for use in any desired manner. Prime using the usual mixtures.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% potassium perchlorate, 35% aluminum powder, 15% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-05-044A: Improves sparkler composition for generating brilliant sparks and star effects:
Into a suitable beaker or similar container, equipped with motorized stirrer, place 500 milliliters of 95% ethyl alcohol, and then add in and dissolve ***45 grams of camphor***. Thereafter, add in ***90 grams of finely divided lampblack***, and blend the mixture on moderate speed during the entire addition. Thereafter, into a separate beaker, equipped with motorized stirrer, place ***50 grams of standard animal glue***, followed by ***75 grams of gum Arabic***, and then add in sufficient water to form a viscous mixture. Thereafter, blend the mixture at 60 to 70 Celsius for about 10 to 15 minutes to form a uniform mass. Note: this glue mixture can be prepared in advance if desired. Thereafter, add this glue mixture to the first mixture, and then blend the whole for about 15 minutes. Finally, add in ***90 grams of coarse iron filings***, followed by ***15 grams of ferric chloride hydrate***, followed by ***136 grams of coarse magnesium grains***, followed by ***362 grams of starch***, and then finally followed by ***650 grams of potassium nitrate***, and then blend the entire mixture on moderate speed for about 45 minutes. Thereafter, the mixture is ready for use. To use the mixture should be layered and coated onto any desirable steel rods of any desired diameter and length to form a smooth coating. The resulting sparklers should then be cured in an oven at moderate temperature in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***42.96% potassium nitrate, 23.92% starch, 8.98% magnesium grains, 5.94% lampblack, 5.94% iron fillings, 4.95% gum Arabic, 3.3% animal glue, 2.97% camphor, 0.99% ferric chloride hydrate, 0.05% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for producing a brilliant display of sparks with star-like secondary effects.

07-05-045A: Dual sparkler composition for generating exploding effects:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***360 grams of gum Arabic***, and then add in 1200 milliliters of warm water. Thereafter, blend the mixture for about 5 to 10 minutes to form a uniform mixture. Thereafter, add in ***110 grams of magnesium carbonate***, followed by ***184 grams of potassium chlorate***, followed by ***176 grams of red iron oxide***. Thereafter,

heat the mixture to about 60 Celsius, and then blend the mixture on moderate speed for about 2 hours. Thereafter, add in ***130 grams of phosphorus pentasulfide***, and then heat the mixture to 100 Celsius, and blend at this temperature for about 1 hour. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, place the mixture onto a shallow pan or tray, and allow the mixture to thoroughly dry. Once it has, the mixture needs to be placed into a ball mill, and milled for about 2 hours under moderate RPM in the usual manner. Thereafter, the mixture is ready for use. To use the mixture, it should be moistened with a little inert solvent, and then the resulting paste should then be layered and coated onto any desirable steel rods of any desired diameter and length to form a smooth coating. The resulting sparklers should then be cured in an oven at moderate temperature in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 8 (based on friction).
Tendency to cake: None.
Explosive ability: None.
Percentage: ***37.5% gum Arabic, 19.16% potassium chlorate, 18.33% red iron oxide, 13.54% phosphorus pentasulfide, 11.45% magnesium carbonate, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for producing intermittent exploding effects.

07-05-045B: Dual sparkler composition for generating exploding effects:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***320 grams of gum Arabic***, and then add in 1200 milliliters of warm water. Thereafter, blend the mixture for about 5 to 10 minutes to form a uniform mixture. Thereafter, add in ***84 grams of magnesium carbonate***, followed by ***172 grams of potassium chlorate***, followed by ***140 grams of black copper-II-oxide***. Thereafter, heat the mixture to about 60 Celsius, and then blend the mixture on moderate speed for about 2 hours. Thereafter, add in ***120 grams of phosphorus pentaselenide*** (the selenium compound of phosphorus), and then heat the mixture to 100 Celsius, and blend at this temperature for about 1 hour. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, place the mixture onto a shallow pan or tray, and allow the mixture to thoroughly dry. Once it has, the mixture needs to be placed into a ball mill, and milled for about 2 hours under moderate RPM in the usual manner. Thereafter, the mixture is ready for use. To use the mixture should be moistened with a little inert solvent, and the resulting paste should then be layered and coated onto any desirable steel rods of any desired diameter and length to form a smooth coating. The resulting sparklers should then be cured in an oven at moderate temperature in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***38.23% gum Arabic, 20.57% potassium chlorate, 16.74% black copper-II-oxide, 14.35% phosphorus pentaselenide, 10% magnesium carbonate, 0.11% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for producing intermittent exploding effects.

07-05-046A: Classic Bengal light composition:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***544 grams of strontium nitrate***, and then followed by ***158 grams of shellac***. Thereafter, gently heat the mixture until the shellac melts, and then blend the mixture for about 10 minutes thereafter. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Now, take the cooled mass and place it into a ball mill, or vertical mixer, filled with Teflon coated steel shot, and then pulverize the mixture for about 30 minutes at any desired RPM. Thereafter, place into a separate clean beaker, equipped with motorized stirrer, ***34 grams of standard animal glue***, followed by ***17 grams of gum tragacanth***, followed by ***90 grams of potassium chlorate***, and then followed by 200 milliliters of water, and then boil the mixture at 100 Celsius for about 10 to 15 minutes. Thereafter, add in the pulverized strontium nitrate/shellac mixture, and then continue to blend the mixture at 100 Celsius for about 30 to 40 minutes. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, the mixture is ready for use. To use, the mixture can be pressed into tablets, pellets, rods, or coated onto paper, cardboard, ect., or formed into any desired tube, container, shape, mold, ect, and then cured in an oven at ordinary temperatures in the usual manner. The composition in any case, needs to be primed with any desired ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5

Tendency to cake: None.
Explosive ability: None.
Percentage: ***64.53% strontium nitrate, 18.74% shellac, 10.67% potassium chlorate, 4.03% animal glue, 2.01% gum tragacanth, 0.02% residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual means.

07-05-047A: Classic Bengal light composition:
Into a suitable beaker or similar container, equipped with motorized stirrer, place ***226 grams of "copal" material***, and then followed by 300 milliliters of ether. Thereafter, blend the mixture at room temperature until a jelly-like material is obtained. Thereafter, add in 100 milliliters of 95% ethyl alcohol, and then gently heat the mixture to about 80 Celsius, and heat at this temperature for about 15 minutes. Note: extinguish all flames, as ether is highly flammable and explosive. Thereafter, while maintaining the mixture temperature at 80 Celsius, add in ***907 grams of strontium nitrate***, followed by ***226 grams of potassium chlorate***. Thereafter, continue to blend the mixture for about 15 minutes. Thereafter, add in ***90 grams of shellac***, and then followed by 70 milliliters of additional 95% ethyl alcohol, and then continue to blend the mixture at 80 Celsius for about 30 to 40 minutes. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, the mixture is ready for use. To use, the mixture can be pressed into tablets, pellets, rods, or coated onto paper, cardboard, ect., or formed into any desired tube, container, shape, mold, ect, and then cured in an oven at ordinary temperatures in the usual manner. The composition in any case, needs to be primed with any desired ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: None.
Percentage: ***62.59% strontium nitrate, 15.59% "copal" material, 15.59% potassium chlorate, 6.21% shellac, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual means.

Section 6: Flash, Bursting Charges, Priming, and Exploding Compositions

- Flash, Bursting Charges, Priming, and Exploding Compositions in this section -

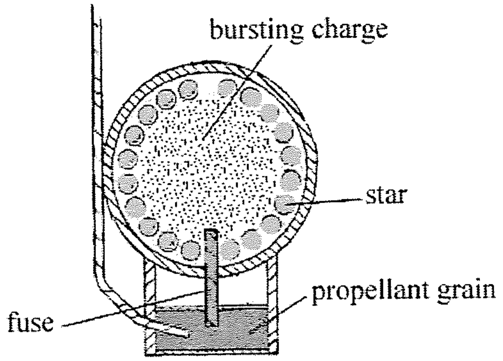
1. 07-01-001A: Popping pyrotechnic composition for use in making friction and pressure sensitive fireworks: *42.1% gum Arabic, 21% clay, 17.5% potassium chlorate, 10.5% antimony sulfide, 7% white phosphorus, 1% potassium dichromate, 0.90% moisture and residue*	**2. 07-01-002A: Loud popping pyrotechnic composition for use in making firecrackers:** *45.7% potassium perchlorate, 40% aluminum, 14.2% sulfur, 0.10% residue*
3. 07-01-003A: Loud exploding pyrotechnic composition with friction sensitivity: *33.3% potassium perchlorate, 29.1% aluminum, 16.6% sulfur, 16.6% barium nitrate, 4.1% dextrin, 0.30% residue*	**4. 07-01-004A: Slow burning, intermittent explosion producing, pyrotechnic composition for use in cones and other devices:** *34.6% potassium chlorate, 34.6% magnesium oxide, 11.8% phosphorus sesquisulfide, 9.9% magnesium chloride, 7.9% iron-III-oxide, 0.99% chrome alum, 0.21% balanced*
5. 07-01-004B: Slow burning, intermittent explosion producing, pyrotechnic composition for use in cones and other devices (improved process of manufacture): *34.6% potassium chlorate, 34.6% magnesium oxide, 11.8% phosphorus sesquisulfide, 9.9% magnesium chloride, 7.9% iron-III-oxide, 0.99% chrome alum, 0.21% balanced*	**6. 07-01-004C: Slow burning, intermittent explosion producing, pyrotechnic composition for use in cones and other devices:** *35% potassium chlorate, 35% magnesium oxide, 11.9% phosphorus sesquisulfide, 9.9% chrome alum, 7.9% beach sand filler, 0.30% impurities*
7. 07-01-004D: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices with gum Arabic filler: *43.8% magnesium oxide, 31.2% potassium chlorate, 10% phosphorus sesquisulfide, 6.1% chrome alum, 6.1% iron oxide, 2.4% gum Arabic, 0.40% mixed balance*	**8. 07-01-004E: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices (modified):** *34.6% potassium chlorate, 34.6% magnesium oxide, 11.8% phosphorus sesquisulfide, 7.9% pipe clay, 4.9% potassium dichromate, 4.9% beach sand, 0.99% gum Arabic, 0.31% balance*
9. 07-01-004F: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices (modified): *32.6% potassium perchlorate, 24.4% magnesium oxide, 14.2% phosphorus sesquisulfide, 12.2% magnesium chloride hexahydrate, 8.1% potassium chlorate, 8.1% fine grain sand, 0.40% mixed residues*	**10. 07-01-004G: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices (modified):** *31.4% potassium chlorate, 20.9% magnesium sulfate hexahydrate, 13.9% heavy magnesium oxide, 8.3% phosphorus sesquisulfide, 7.6% light magnesium oxide, 6.99% ground glass, 6.2% iron-III-oxide, 2.7% gum Arabic, 1.3% sulfur, 0.71% balance*
11. 07-01-005A: Percussion composition causing explosion upon impact: *39.6% gum Arabic, 27.5% potassium chlorate, 13.7% iron sesquioxide, 10.3% phosphorus sesquisulfide, 6.8% magnesium carbonate, 1.7% calcium carbonate, 0.40% mixed impurities*	**12. 07-01-006A: Pyrotechnic composition for use in fireworks:** *39.6% gum Arabic, 27.5% potassium chlorate, 13.7% iron sesquioxide, 10.3% phosphorus sesquisulfide, 6.8% magnesium carbonate, 1.7% calcium carbonate, 0.40% mixed impurities*
13. 07-01-007A: Pyrotechnic composition for use in large firecrackers such as M-80's: *36% potassium chlorate, 14% lead tetraoxide, 11% cow lard, 11% manganese dioxide, 7% sulfur, 4% potassium ferrocyanide, 4% zinc oxide, 4% nut-galls, 4% wood charcoal, 4% iron oxide, 1% impurities, probably moisture*	**14. 07-01-008A: Pyrotechnic composition for use in firecrackers and exploding stars:** *80% potassium chlorate, 10% dry pitch, 6% vegetable oil, 4% charcoal*
15. 07-01-008B: Pyrotechnic composition for use in firecrackers and exploding stars with picric acid booster: *80% potassium chlorate, 10% dry pitch, 6% vegetable oil, 2% charcoal, 2% picric acid*	**16. 07-01-009A: Pyrotechnic composition for use in firecrackers and exploding devices utilizing nitrophenol:** *62.96% nitrophenol, 25.92% potassium chlorate, 11.11% marble dust, 0.01% mixed balance*
17. 07-01-010A: Percussion/friction sensitive pyrotechnic composition for generating loud successive reports for various uses: *42.1% gum Arabic, 21.05% powdered clay, 17.54% potassium chlorate, 10.52% black antimony sulfide, 7.01% white phosphorus, 1.75% potassium dichromate, 0.03% balance*	**18. 07-06-011A: Classic flash charge for use in fireworks:** *50% potassium perchlorate, 27% sulfur, 23% aluminum*
19. 07-06-011B: Classic flash charge for use in fireworks: *70% potassium perchlorate, 30% aluminum*	**20. 07-06-011C: Classic flash charge for use in fireworks (solvent blended process):** *50% potassium nitrate, 30% sulfur, 20% aluminum powder*
21. 07-06-011D: Classic green flash charge for use in fireworks (solvent blended process): *50% magnesium, 50%*	**22. 07-06-011E: Classic flash charge for use in fireworks (solvent blended process):** *24% potassium nitrate, 24%*

barium sulfate	*aluminum, 24% potassium perchlorate, 8% sulfur, 8% antimony trisulfide, 8% barium nitrate, 4% dextrin*
23. 07-06-012A: Classic flash charge for use in fireworks fortified with potassium permanganate (solvent blended process): *41% potassium permanganate, 35% sulfur, 24% aluminum*	**24. 07-06-013A: Classic flash charge for use in fireworks fortified with potassium permanganate (dry mix process):** *68% barium nitrate, 23% pyrotechnics grade aluminum, 9% sulfur*
25. 07-06-014A: Standard bursting charge for small aerial shells: *75% potassium chlorate, 23% hemp coal, 2% rich starch*	**26. 07-06-014B: Standard bursting charge for small aerial shells:** *69% potassium perchlorate, 17% hemp coal, 12% sulfur, 2% rich starch*
27. 07-06-014C: Standard bursting charge for small aerial shells (utilizing perchlorate rather then chlorate): *69% potassium perchlorate, 29% hemp coal, 2% rich starch*	**28. 07-06-015A: Smokeless flash powder for use in fireworks:** *29% barium nitrate, 27% zirconium metal, 26% barium oxide, 7% magnesium, 7% zirconium hydride, 4% rice starch*
29. 07-06-016A: Photo flash composition for use in fireworks, but also for commercial use in flares: *40% atomized aluminum, 30% potassium perchlorate, 30% barium nitrate*	**30. 07-06-017A: Purple flash composition for use in fireworks:** *37% magnesium metal, 37% potassium perchlorate, 11% strontium nitrate, 11% copper-II-oxide, 3% PVC, 1% impurities,*
31. 07-06-018A: Simple yellow flash composition for use in fireworks: *86% sodium nitrate, 14% magnesium metal*	**32. 07-06-019A: Classic green flash composition for use in fireworks:** *43% potassium perchlorate, 36% aluminum metal, 21% barium nitrate*
33. 07-06-020A: Classic priming composition: *44.44% barium nitrate, 33.33% potassium nitrate, 11.11% sulfur, 11.11% shellac, 0.01% impurities*	**34. 07-06-021A: Classic priming composition:** *70% potassium perchlorate, 13% soft wood charcoal, 8% manganese dioxide, 4% red gum, 4% flaked aluminum, 1% dextrin*
35. 07-06-022A: Classic priming composition for use with stars: *54% potassium perchlorate, 24% dextrin, 16% wood charcoal, 6% silicon*	**36. 07-06-023A: Standard priming composition for strobes, stars, and similar compositions containing ammonium perchlorate:** *74% potassium perchlorate, 12% rosin, 6% hemp coal, 5% potassium dichromate, 3% flaked aluminum*
37. 07-06-024A: Standard priming composition for chlorate stars: *49.52% potassium chlorate, 28.57% wood charcoal, 9.5% lampblack, 7.61% potassium nitrate, 4.76% animal glue, 0.04% impurities*	**38. 07-06-025A: "Electric match" priming composition/device for initiating motors, and rockets:** *51.61% potassium chlorate, 16.12% carboxymethylcellulose, 9.67% lamp black, 9.67% magnalium alloy, 6.45% atomized aluminum, 6.45% zirconium metal, 0.03% nitrocellulose*
39. 07-06-026A: Classic flash charge for use in fireworks and other purposes: *70% potassium perchlorate, 30% dark grade aluminum powder*	**40. 07-06-027A: Classic flash charge for use in fireworks and other purposes:** *42.85% potassium perchlorate, 42.85% aluminum powder, 14.28% sulfur, 0.02% mixed balance*
41. 07-06-028A: Classic green flash charge for use in fireworks and other purposes: *57.14% barium nitrate, 28.57% aluminum powder, 14.28% sulfur, 0.01% mixed residual balance*	**42. 07-06-029A: Classic flash charge for use in fireworks and other purposes:** *72.72% potassium perchlorate, 24.54% aluminum powder, 2.72% sulfur, 0.02% balance*
43. 07-06-029B: Classic flash charge for use in fireworks and other purposes: *64% potassium perchlorate, 23% aluminum powder, 13% sulfur*	**44. 07-06-030A: Classic bursting charge with extra heaving action:** *53.03% potassium perchlorate, 22.72% hemp coal, 18.93% lampblack, 3.78% potassium dichromate, 1.51% rice starch, 0.03% mixed balance*
45. 07-06-031A: Priming composition with permanganate oxidizer: *53.46% potassium permanganate, 46.53% potassium permanganate, 0.01% residual balance*	

07-01-001A: Popping pyrotechnic composition for use in making friction and pressure sensitive fireworks: Into a suitable beaker or similar container, equipped with motorized stirrer with a plastic stir blade, place 87 milliliters of water, followed by ***10 grams of white phosphorus***, followed by ***25 grams of potassium chlorate***, followed by ***30 grams of standard clay***, followed by ***15 grams of antimony sulfide***, followed by ***60 grams of gum Arabic***, followed by ***2.5 grams of potassium dichromate***, and thereafter, heat the mixture to 48 Celsius with gentle stirring for about 15 to 30 minutes to form a uniform mixture. Afterwards, stop the stirring, remove the heat source, and then what you do next depends on several factors. If you wish to make loud popping devices that explode with successive loud bangs when thrown against the ground, the pyrotechnic mixture needs to be cooled to room temperature, and then placed, in the desired quantity, into individual capsules, paper bundles, ect., and then allowed to thoroughly air dry for several days or more. If you wish to use the pyrotechnic composition in any desired firework display, friction sensitive devices or the like, the hot mixture needs to be gently pressed, rolled, or formed into any desirable shape or size, and then allowed to thoroughly air-dry. Note: this substance is friction sensitive so rubbing, grinding, ect., should be avoided. Note: in order for this mixture to work properly it needs to be as dry as possible, so curing times may vary.

Burn rate: Very fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 10
Tendency to cake: None.
Explosive ability: Average
Percentage: ***42.1% gum Arabic, 21% clay, 17.5% potassium chlorate, 10.5% antimony sulfide, 7% white phosphorus, 1% potassium dichromate, 0.90% moisture and residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks to achieve successive loud popping noises with flashes. Can also be used as a primer.

Standard Aerial mortar shell



07-01-002A: Loud popping pyrotechnic composition for use in making firecrackers: Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place 175 milliliters of acetone, followed by ***70 grams of standard powdered aluminum***, followed by ***25 grams of finely divided sulfur***, and then gently blend the mixture for about 10 minutes. Thereafter, add in ***80 grams of potassium perchlorate***, and then continue to gently blend the mixture until the bulk of the acetone evaporates. When the bulk of the acetone evaporates, and only a mild pasty mass remains, the mixture is ready to be pressed. To use, simply press the pasty mass into any desirable paper, cardboard, or plastic tube, ball, or any other suitable firecracker body, and then allow it to cure for a day or so at room temperature. In most cases, a standard time fuse should be inserted into the munition body before the curing process.
Burn rate: Very fast
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+
Ease of ignition (1 to 10): 10
Tendency to cake: None.
Explosive ability: Average
Percentage: ***45.7% potassium perchlorate, 40% aluminum, 14.2% sulfur, 0.10% residue***
Classification: Deflagrating explosive (classified as consumer explosives firework composition).
Use: Used in making firecrackers. Can also be used as a primer.

07-01-003A: Loud exploding pyrotechnic composition with friction sensitivity: Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place 175 milliliters of acetone, followed by ***175 grams of standard powdered aluminum***, followed by ***100 grams of finely divided sulfur***, followed by ***25 grams of dextrin***, followed by ***100 grams of coarse sand*** of 0.20 to 0.50 millimeters in diameter, and then gently blend the mixture for about 10 minutes. Thereafter, add in 50 additional milliliters of acetone, and then add in ***200 grams of potassium perchlorate***, followed by ***100 grams of barium nitrate***, and then continue to gently blend the mixture until the bulk of the acetone evaporates. When the bulk of the acetone evaporates, and only a mild pasty mass remains, the mixture is ready to be pressed. To use, simply press the pasty mass into any desirable paper, cardboard, or plastic tube, ball, or any other suitable firecracker body, and then allow it to cure for a day or so at room temperature. Because the composition is sensitive to friction, your munitions can be designed so as to explode upon impact, i.e., for making impact sensitive firecrackers, ect.
Burn rate: Very fast.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+

Ease of ignition (1 to 10): 10
Tendency to cake: None.
Explosive ability: Average
Percentage: *28.57% potassium perchlorate, 25% aluminum, 14.28% coarse sand, 14.28% sulfur, 14.28% barium nitrate, 3.57% dextrin, 0.02% residue*
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in making friction and impact sensitive firecrackers. Can also be used as a primer.

07-01-004A: Slow burning, intermittent explosion producing, pyrotechnic composition for use in cones and other devices:

Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place *40 grams of iron-III-* followed by *60 grams of phosphorus sesquisulfide*, followed by *5 grams of chromium potassium sulfate* (chrome alum), *oxide*, followed by *60 grams of phosphorus sesquisulfide*, followed by *175 grams of magnesium oxide*, and then tumble the mixture followed by *50 grams of anhydrous magnesium chloride*, followed by *175 grams of magnesium oxide*, and then tumble the mixture at 100 to 200 RPM for about 1 hour or so. Thereafter, throw in *175 grams of potassium chlorate*, and then continue to tumble the mixture at 150 RPM for about 30 to 40 minutes to form a uniform mixture. Thereafter, the mixture is ready to be pressed. To do so, place the above mixture into a suitable beaker or other suitable mixing container, and then add in 100 milliliters of diethyl ether. Thereafter, manual or mechanically blend the mixture for about 10 to 15 minutes to form a paste. Thereafter, press the paste into any tube, container, cone, ect., ect., in the usual manner then allow the munitions to cure for a day or more.

Burn rate: Below average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on burn rate).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Mild.
Percentage: *34.6% potassium chlorate, 34.6% magnesium oxide, 11.8% phosphorus sesquisulfide, 9.9% magnesium chloride, 7.9% iron-III-oxide, 0.99% chrome alum, 0.21% balanced*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making interesting crackling and popping firework compositions.

07-01-004B: Slow burning, intermittent explosion producing, pyrotechnic composition for use in cones and other devices (improved process of manufacture):

Into a suitable beaker or similar container, equipped with motorized stirrer, place 75 milliliters of warm water, and then add and dissolve *5 grams of chromium potassium sulfate* (anhydrous), and then add in *175 grams of potassium chlorate*, followed by *40 grams of red iron-III-oxide*, and then blend the mixture on moderate speed for about 30 minutes to form a paste. Thereafter, add in *175 grams of magnesium oxide*, followed by *50 grams of magnesium chloride*, and then continue to blend the mixture for about 10 to 15 minutes. After which, add in *60 grams of phosphorus sesquisulfide*, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing and forming. To do so, simply press the pasty mass into any desirable shape, into any desirable tube, cone, ect., and then cure the munition in an oven at 70 Celsius until dry and hard.

Burn rate: Below average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on ignition).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Mild.
Percentage: *34.6% potassium chlorate, 34.6% magnesium oxide, 11.8% phosphorus sesquisulfide, 9.9% magnesium chloride, 7.9% iron-III-oxide, 0.99% chrome alum, 0.21% balanced*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making interesting crackling and popping firework compositions.

07-01-004C: Slow burning, intermittent explosion producing, pyrotechnic composition for use in cones and other devices:

Into a suitable beaker or similar container, equipped with motorized stirrer, place 250 milliliters of warm water, and then add and dissolve *45 grams of chromium potassium sulfate* (anhydrous), and then add in *159 grams of potassium chlorate*, followed by *36 grams of fine grained silicon dioxide (beach sand)*, and then blend the mixture on moderate speed for about 30 minutes to form a paste. Thereafter, add in *159 grams of magnesium oxide*, and then continue to blend the mixture for about 10 to 15 minutes. Thereafter, add in *54 grams of phosphorus sesquisulfide*, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing and forming. To do so, simply press the pasty mass into any desirable shape, into any desirable tube, cone, ect., and then cure the munition in an oven at 70 Celsius until dry and hard. The paste can also be spread out onto sheets, dried, and then when ignited, will burn with rapid successive explosions producing a cool effect.

Burn rate: N/A

Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Mild.
Percentage: *35% potassium chlorate, 35% magnesium oxide, 11.9% phosphorus sesquisulfide, 9.9% chrome alum, 7.9% beach sand filler, 0.30% impurities*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making interesting crackling and popping firework compositions with cool effects.

07-01-004D: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices with gum Arabic filler:

Into a suitable beaker or similar container, equipped with motorized stirrer, place 75 milliliters of cold water, and then add and dissolve *18 grams of gum Arabic*, and then stir the mixture for about 10 minutes, and then allow the mixture to stand 24 hours. Thereafter, into a separate beaker or similar container, equipped with motorized stirrer in the usual means, place 250 milliliters of warm water, and then add and dissolve *45 grams of chromium potassium sulfate.* Thereafter, add in the chromium potassium sulfate solution, followed by *45 grams of red iron-III-oxide,* followed by *227 grams of potassium chlorate*, and then blend the mixture for about 10 minutes. Thereafter add in *73 grams of phosphorus sesquisulfide*, and then continue to blend the mixture for about 30 minutes. Now, add in the gum Arabic solution, previously prepared, and then continue to blend the mixture for about 15 minutes. After 15 minutes, add in *318 grams of magnesium oxide*, and then continue to blend the mixture for about 30 minutes to form a uniform colloidal mixture. After 30 minutes, the mixture is ready for pressing and forming. To do so, simply press the pasty mass into any desirable shape, into any desirable tube, cone, ect., and then cure the munition in an oven at 80 to 90 Celsius until dry and hard. The paste can also be spread out onto sheets, dried, and then when ignited, will burn with rapid successive explosions producing a cool effect.

Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Mild.
Percentage: *43.8% magnesium oxide, 31.2% potassium chlorate, 10% phosphorus sesquisulfide, 6.1% chrome alum, 6.1% iron oxide, 2.4% gum Arabic, 0.40% mixed balance*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making interesting successive exploding firework devices with cool effects.

07-01-004E: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices (modified):

Into a suitable beaker or similar container, place 250 milliliters of cold water, and then add and dissolve *5 grams of gum Arabic.* Thereafter, add in *25 grams of potassium dichromate*, followed by *175 grams of potassium chlorate*, followed by *175 grams of magnesium oxide*, and then blend the mixture for about 15 minutes. After 15 minutes, add in *60 grams of phosphorus sesquisulfide*, followed by *25 grams of fine grain beach sand*, followed by *40 grams of pipe clay*, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing and forming. To do so, simply press the pasty mass into any desirable shape, into any desirable tube, cone, ect., and then cure the munition in an oven at 70 Celsius until dry and hard. The paste can also be spread out onto sheets, dried, and then when ignited, will burn with rapid successive explosions producing a cool effect.

Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Mild.
Percentage: *34.6% potassium chlorate, 34.6% magnesium oxide, 11.8% phosphorus sesquisulfide, 7.9% pipe clay, 4.9% potassium dichromate, 4.9% beach sand, 0.99% gum Arabic, 0.31% balance*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making interesting successive exploding firework devices with cool effects.

07-01-004F: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices (modified):

Into a suitable beaker or similar container, place 150 milliliters of cold water, and then add and dissolve *60 grams of magnesium chloride hexahydrate*. Thereafter, add in *40 grams of potassium chlorate*, followed by *160 grams of potassium perchlorate*, followed by *40 grams of fine grain sand*, and then blend the mixture for about 15 minutes. After 15 minutes, add in *120 grams of magnesium oxide*, followed by *70 grams of phosphorus sesquisulfide*, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing and forming. To do so, simply press the pasty mass into any desirable shape, into any desirable tube, cone, ect., and then cure the munition in an oven at 70 Celsius until dry and hard. The paste can also be spread out onto sheets, dried, and then when ignited, will burn with rapid successive explosions producing a cool effect.

Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Average.
Percentage: *32.6% potassium perchlorate, 24.4% magnesium oxide, 14.2% phosphorus sesquisulfide, 12.2% magnesium chloride hexahydrate, 8.1% potassium chlorate, 8.1% fine grain sand, 0.40% mixed residues*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making interesting successive exploding firework devices with cool effects.

07-01-004G: Intermittent explosion producing, pyrotechnic composition for use in cones and other devices (modified):

Into a suitable beaker or similar container, place *60 grams of phosphorus sesquisulfide*, followed by *10 grams of sulfur*, and then heat the mixture gently to 50 Celsius to form molten mass. Thereafter, stir the mixture for about 5 to 10 minutes at 50 Celsius. Thereafter, remove the heat source, and allow the mixture to cool and resolidified. Now, into a separate clean beaker, equipped with motorized stirrer, place 75 milliliters of cold water, followed by *20 grams of gum Arabic*, followed by *100 grams of heavy magnesium oxide*, followed by *55 grams of light magnesium oxide*, followed by *150 grams of magnesium sulfate hexahydrate*, and then blend the mixture on moderate speed for about 10 to 15 minutes. Thereafter, add in the phosphorus sesquisulfide/sulfur mixture prepared first, followed by *225 grams of potassium chlorate*, and then continue to blend the mixture on moderate speed for about 15 minutes. After 15 minutes, add in *50 grams of ground glass*, and then followed by *45 grams of red iron-III-oxide*, and then continue to blend the mixture for about 15 minutes to form a uniform paste. Thereafter, the paste is ready for use. To use, the paste simply needs to be pressed into any shape of any size, ect., and then cure the devices in an oven at 60 Celsius until dry.

Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Average.
Percentage: *31.4% potassium chlorate, 20.9% magnesium sulfate hexahydrate, 13.9% heavy magnesium oxide, 8.3% phosphorus sesquisulfide, 7.6% light magnesium oxide, 6.99% ground glass, 6.2% iron-III-oxide, 2.7% gum Arabic, 1.3% sulfur, 0.71% balance*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making interesting successive exploding firework devices with cool effects.

07-01-005A: Percussion composition causing explosion upon impact:

Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place 150 milliliters of cold water, followed by *60 gram of phosphorus sesquisulfide*, followed by *230 grams of gum Arabic*, followed by *40 grams of magnesium carbonate*, followed by *10 grams of calcium carbonate*, followed by *160 grams of potassium chlorate*, and then followed by *80 grams of iron sesquioxide* (red ochre), and then blend the mixture for about 30 minutes to form a uniform paste. If the mixture is too dry, add in more water. Once the paste has been formed and thoroughly mixed, the mixture is ready for use. To use, the paste simply needs to be spread out on any suitable objects, preferably metal or marble balls, and then allowed to cure for 48 hours or more. The objects can be heated in an oven for faster drying times, but temperature may vary.

Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Explodes upon impact.
Percentage: *39.6% gum Arabic, 27.5% potassium chlorate, 13.7% iron sesquioxide, 10.3% phosphorus sesquisulfide, 6.8% magnesium carbonate, 1.7% calcium carbonate, 0.40% mixed impurities*
Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Used in making percussion sensitive firework munitions such as exploding balls; for example, the composition can be coated on marble balls, and the balls can be tied together using a rope. These balls can then be thrown against a target, where upon a loud popping sound will be created when the balls impact each other. Other devices include any suitable object that will "pop" on impact.

07-01-006A: Pyrotechnic composition for use in fireworks:

Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place 150 milliliters of cold water, followed by *60 gram of phosphorus sesquisulfide*, followed by *230 grams of gum Arabic*, followed by *40 grams of magnesium carbonate*, followed by *10 grams of calcium carbonate*, followed by *160 grams of potassium chlorate*, and then followed by *80 grams of iron sesquioxide* (red ochre), and then blend the mixture for about 30 minutes to form a uniform paste. If the mixture is too dry, add in more water. Once the paste has been formed and thoroughly mixed, the mixture is ready for use. To use, the paste simply needs to be spread out on any suitable objects, preferably metal or marble balls, and then allowed to cure for 48 hours or more. The objects can be heated in an oven for faster drying times, but temperature may vary.

Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 to 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on ignition).
Tendency to cake: None.
Explosive ability: Explodes upon impact.
Percentage: *39.6% gum Arabic, 27.5% potassium chlorate, 13.7% iron sesquioxide, 10.3% phosphorus sesquisulfide, 6.8% magnesium carbonate, 1.7% calcium carbonate, 0.40% mixed impurities*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in making percussion sensitive firework munitions such as exploding balls; for example, the composition can be coated on marble balls, and the balls can be tied together using a rope. These balls can then be thrown against a target, where upon a loud popping sound will be created when the balls impact each other. Other devices include any suitable object that will "pop" on impact.

07-01-007A: Pyrotechnic composition for use in large firecrackers such as M-80's:

Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place 150 milliliters of diethyl ether, followed by *50 grams of potassium chlorate*, followed by *15 grams of manganese dioxide*, followed by *20 grams of lead tetraoxide (Pb_3O_4)*, followed by *10 grams of flours of sulfur*, followed by *5 grams of potassium ferrocyanide*, followed by *5 grams of zinc oxide*, followed by *5 grams of finely powdered antimony metal*, followed by *5 grams of powdered wood charcoal*, followed by *5 grams of nut-galls*, followed by *5 grams of red iron-III-oxide*, followed by *15 grams of standard cow lard*, and then followed by 35 grams of carbon disulfide. Thereafter, blend the mixture in a well ventilated area until the bulk of the solvents evaporate. Thereafter, place the semi-solid mass onto a shallow tray or pan, in the usual manner, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 75 grams of Teflon coated steel shot of 2 to 3 millimeters in diameter, and then carefully tumble the mixture at 50 to 75 RPM for about 1 to 2 hours, to form a uniform mixture. Thereafter, the mixture is readily pressed or wrapped tightly into any tube, ect., in the usual means. Note: this mixture should be primed with a priming mixture for proper ignition.

Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on successive explosions).
Ease of ignition (1 to 10): 9+ (based on ignition).
Tendency to cake: None.
Explosive ability: Explodes upon ignition (when properly ignited).
Percentage: *36% potassium chlorate, 14% lead tetraoxide, 11% cow lard, 11% manganese dioxide, 7% sulfur, 4% potassium ferrocyanide, 4% zinc oxide, 4% nut-galls, 4% wood charcoal, 4% iron oxide, 1% impurities, probably moisture*
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in firecrackers, and other exploding fireworks.

07-01-008A: Pyrotechnic composition for use in firecrackers and exploding stars:

Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place 150 milliliters of acetone, followed by *240 grams of potassium chlorate*, followed by *30 grams of dry pitch*, followed by *18 grams of vegetable oil*, followed by *12 grams of charcoal*. Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-solid mass onto a shallow tray or pan, in the usual manner, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 75 grams of Teflon coated steel shot of 2 to 3 millimeters in diameter, and then carefully tumble the mixture at 50 to 75 RPM for about 1 to 2 hours, to form a uniform mixture. Thereafter, the mixture is readily pressed or wrapped tightly into any tube, ect., in the usual means. Note: this mixture should be primed with a priming mixture for proper ignition.

Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.

Flammability (1 to 10): 9+ (based on successive explosions).
Ease of ignition (1 to 10): 9+ (based on ignition).
Tendency to cake: None.
Explosive ability: Explodes upon ignition (when properly ignited).
Percentage: ***80% potassium chlorate, 10% dry pitch, 6% vegetable oil, 4% charcoal***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in firecrackers, and other exploding fireworks.

07-01-008B: Pyrotechnic composition for use in firecrackers and exploding stars with picric acid booster:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place 150 milliliters of acetone, followed by ***240 grams of potassium chlorate***, followed by ***30 grams of dry pitch***, followed by ***18 grams of vegetable oil,*** followed by ***6 grams of charcoal,*** followed by ***6 grams of picric acid.*** Thereafter, blend the mixture until the bulk of the solvent evaporates. Thereafter, place the semi-solid mass onto a shallow tray or pan, in the usual manner, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with 75 grams of Teflon coated steel shot of 2 to 3 millimeters in diameter, and then carefully tumble the mixture at 50 to 75 RPM for about 1 to 2 hours, to form a uniform mixture. Thereafter, the mixture is readily pressed or wrapped tightly into any tube, ect., in the usual means. Note: this mixture should be primed with a priming mixture for proper ignition.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on successive explosions).
Ease of ignition (1 to 10): 9+ (based on ignition).
Tendency to cake: None.
Explosive ability: Explodes upon ignition (when properly ignited).
Percentage: ***80% potassium chlorate, 10% dry pitch, 6% vegetable oil, 2% charcoal, 2% picric acid***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in firecrackers, and other exploding fireworks.

07-01-009A: Pyrotechnic composition for use in firecrackers and exploding devices utilizing nitrophenol:
Into a suitable mixing bowl, equipped with motorized stirrer in the usual means, place ***75 grams of finely powdered marble dust***, followed by ***175 grams of potassium chlorate***, and then followed by ***425 grams of nitrophenol.*** Thereafter, blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, the mixture is readily pressed or wrapped tightly into any tube, ect., in the usual means. Note: this mixture should be primed with a priming mixture for proper ignition.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9+ (based on successive explosions).
Ease of ignition (1 to 10): 9+ (based on ignition).
Tendency to cake: None.
Explosive ability: Explodes upon ignition (when properly ignited).
Percentage: ***62.96% nitrophenol, 25.92% potassium chlorate, 11.11% marble dust, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in firecrackers, and other exploding fireworks.

07-01-010A: Percussion/friction sensitive pyrotechnic composition for generating loud successive reports for various uses:
Into a suitable mixing bowl, equipped with inert atmosphere and motorized stirrer, place 500 milliliters of cold water. Thereafter, add in ***50 grams of white phosphorus***, followed by***125 grams potassium chlorate***, followed by ***150 grams of powdered clay***, followed by ***75 grams of black antimony sulfide***, followed by ***300 grams of gum Arabic***, and then followed by ***12.5 grams of potassium dichromate***. Thereafter, heat the mixture to about 50 Celsius, and blend the mixture for about 2 hours. Thereafter, the mixture is ready for use. Note: the mixture should be used while it's still hot. To use, the mixture can be pressed into small tablets, pellets, rods, ect., or it can be coated onto sticks, rods, ect., and then cured in an oven at moderate temperature.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 (based on successive explosions).
Ease of ignition (1 to 10): 8+ (based on percussion).
Tendency to cake: None.
Explosive ability: Explodes upon ignition.
Percentage: ***42.1% gum Arabic, 21.05% powdered clay, 17.54% potassium chlorate, 10.52% black antimony sulfide, 7.01% white phosphorus, 1.75% potassium dichromate, 0.03% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used to make percussion sensitive "popping" fireworks, exploding matches, or sparkles, or for any desired means.

07-06-011A: Classic flash charge for use in fireworks:
Into a suitable ball mill, minus the steel shot, place ***250 grams of finely powdered potassium perchlorate***, followed by ***115 grams of finely powdered aluminum metal***, and then followed by ***135 grams of finely powdered sulfur***. Thereafter, carefully tumble the mixture at 75 to 100 RPM for about 2 hours to form a uniform powder. Thereafter, the powder is ready for use. To use, it simply needs to be moistened with a small amount of alcohol to form a gentle paste. This paste should then be rolled into balls, or pressed into tablets, pellets, molds, ect under the usual means, and then allow the pressed or rolled grains to thoroughly dry. An oven may be used, but the temperature should be closely monitored.
Burn rate: Above average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes upon ignition.
Percentage: ***50% potassium perchlorate, 27% sulfur, 23% aluminum***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in fireworks for generating a brilliant flash of light along with a report.

07-06-011B: Classic flash charge for use in fireworks:
Into a suitable ball mill, minus the steel shot, simply place ***350 grams of finely powdered potassium perchlorate***, and then simply followed by ***1150 grams of finely powdered aluminum metal.*** Thereafter, carefully tumble the mixture at 75 to 100 RPM for about 2 hours to form a uniform powder. Thereafter, the powder is ready for use. To use, it simply needs to be moistened with a small amount of alcohol to form a gentle paste. This paste should then be rolled into balls, or pressed into tablets, pellets, molds, ect., under the usual means, and then allow the pressed or rolled grains to thoroughly dry. An oven may be used, but the temperature should be closely monitored.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes upon ignition.
Percentage: ***70% potassium perchlorate, 30% aluminum***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in fireworks for generating a brilliant flash of light along with a report.

07-06-011C: Classic flash charge for use in fireworks (solvent blended process):
Into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***250 grams of potassium nitrate,*** followed by ***150 flours of sulfur,*** and then followed by ***100 grams of aluminum powder***. Thereafter add in 150 milliliters of acetone, and then blend the mixture until the bulk of the acetone evaporates. When this point has been achieved, place the semi-dried mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Once it has, the dried mass simply needs to be pressed into any desirable paper container, or the dried mass can be wetted with a little alcohol to form a paste. This paste can then be rolled into balls, or wrapped in any paper container, or material in the usual manner, and then allowed to dry.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes upon ignition
Percentage: ***50% potassium nitrate, 30% sulfur, 20% aluminum powder***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in fireworks for generating a brilliant flash of light along with a report. Must be confined in order to get report.

07-06-011D: Classic green flash charge for use in fireworks (solvent blended process):
Like before, into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***500 grams of finely powdered magnesium***, and then followed by ***500 grams of finely powdered barium sulfate***. Thereafter add in 175 milliliters of acetone or ether, and then blend the mixture until the bulk of the acetone or ether evaporates. When this point has been achieved, place the semi-dried

mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Once it has, the dried mass needs to be ball milled using small diameter Teflon coated shot under mild RPM (avoid any significant grinding or bumping) to form a uniform powder. Thereafter, wet the dried powder with a little alcohol to form a paste. This paste can then be rolled into balls, or wrapped into any paper container, or material in the usual manner, and then allowed to dry.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes upon ignition.
Percentage: ***50% magnesium, 50% barium sulfate***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in fireworks for generating a brilliant flash of light along with a report. Must be confined in order to get report.

07-06-011E: Classic flash charge for use in fireworks (solvent blended process):

Like before, into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***300 grams of potassium nitrate,*** followed by ***50 grams of powdered dextrin,*** followed by ***100 grams of flours of sulfur,*** followed by ***100 grams of antimony trisulfide (Sb2S3),*** followed by ***100 grams of barium nitrate,*** followed by ***300 grams of dark aluminum material (USB 809 grade),*** and thereafter, add in 200 milliliters of acetone or ether, and then blend the mixture for about 15 to 20 minutes. Thereafter, add in ***300 grams of potassium perchlorate,*** and then continue to blend the mixture until the bulk of the acetone or ether evaporates. When this point has been achieved, place the semi-dried mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Once it has, the dried mass needs to be ball milled using small diameter Teflon coated shot under mild RPM (avoid in significant grinding or bumping) to form a uniform powder. Thereafter, wet the dried powder with a little alcohol to form a paste. This paste can then be rolled into balls, or wrapped into any paper container, or material in the usual manner, and then allowed to dry. Instead of forming a paste, the dry tumbled powder can be used as is in flash bags or similar things.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes upon ignition.
Percentage: ***24% potassium nitrate, 24% aluminum, 24% potassium perchlorate, 8% sulfur, 8% antimony trisulfide, 8% barium nitrate, 4% dextrin***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in fireworks for generating a brilliant flash of light along with a report.

07-06-012A: Classic flash charge for use in fireworks fortified with potassium permanganate (solvent blended process):

Like before, into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***240 grams of potassium permanganate,*** followed by ***140 grams of finely powdered aluminum,*** and then followed by ***200 grams of flours of sulfur.*** Thereafter, add in 125 milliliters of acetone or ether, and then blend the mixture until the bulk of the acetone or ether evaporates. When this point has been achieved, place the semi-dried mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Once it has, the dried mass needs to be ball milled using small diameter Teflon coated shot under mild RPM (avoid any significant grinding or bumping) to form a uniform powder. Thereafter, wet the dried powder with a little alcohol to form a paste. This paste can then be rolled into balls, or wrapped into any paper container, or material in the usual manner, and then allowed to dry. Instead of forming a paste, the dry tumbled powder can be used as is, or placed into flash bags or similar items.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for a long two – keep dry at all times and avoid friction.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Moderate.
Percentage: ***41% potassium permanganate, 35% sulfur, 24% aluminum,***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in fireworks for generating a brilliant flash of light in the usual manner.

07-06-013A: Classic flash charge for use in fireworks fortified with potassium permanganate (dry mix process):

Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of 2 to 3 millimeters in diameter, place ***340 grams of barium nitrate,*** followed by ***115 grams of dark pyrotechnics grade aluminum,*** and then followed by ***45 grams of flours of sulfur,*** and then tumble the dry mixture at 250 RPM for about 30 to 40 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, the powder can be used directly in flash bags, or it can be wetted with a little alcohol to form a mild paste. Thereafter, the paste can be pressed into containers, molds, paper tubes, or the like and then allowed to dry. The mixture is readily ignited.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Moderate.
Percentage: ***68% barium nitrate, 23% pyrotechnics grade aluminum, 9% sulfur***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in fireworks for generating a brilliant flash of light in the usual manner followed by a report.

07-06-014A: Standard bursting charge for small aerial shells:

Into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***375 grams of potassium chlorate,*** followed by ***115 grams of finely powdered hemp coal,*** and then followed by ***10 grams of glutinous rice starch.*** Thereafter, add in 125 milliliters of acetone or ether, and then blend the mixture until the bulk of the acetone or ether evaporates. When this point has been achieved, place the semi-dried mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Once it has, the dried mass needs to be ball milled using small diameter Teflon coated shot under mild RPM (avoid any significant grinding or bumping) to form a uniform powder. Thereafter, wet the dried powder with a little alcohol to form a paste. This paste can then be rolled into balls, or wrapped into any paper containers, or material in the usual manner, and then allowed to dry. Instead of forming a paste, the dry tumbled powder can be used in loose form if desired, but should be confined in the usual manner, i.e., as in the center of the aerial shell. Readily ignites, but should be primed in the usual manner.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Ignites rapidly, producing a bursting effect.
Percentage: ***75% potassium chlorate, 23% hemp coal, 2% rich starch***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in small aerial shells, 2 to 3 inches in diameter to burst open the shell. Can also be used in Hollywood style effects to burst apart and ignite gasoline mixtures.

07-06-014B: Standard bursting charge for small aerial shells:

Into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***345 grams of potassium perchlorate,*** followed by ***85 grams of finely powdered hemp coal,*** followed by ***60 grams of flours of sulfur,*** and then followed by ***10 grams of glutinous rice starch.*** Thereafter, add in 125 milliliters of acetone or ether, and then blend the mixture until the bulk of the acetone or ether evaporates. When this point has been achieved, place the semi-dried mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Once it has, the dried mass needs to be ball milled using small diameter Teflon coated shot under mild RPM (avoid any significant grinding or bumping) to form a uniform powder. Thereafter, wet the dried powder with a little alcohol to form a paste. This paste can then be rolled into balls, or wrapped into any paper containers, or material in the usual manner, and then allowed to dry. Instead of forming a paste, the dry tumbled powder can be used in loose form if desired, but should be confined in the usual manner, i.e., as in the center of the aerial shell. Readily ignites, but should be primed in the usual manner.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Ignites rapidly, producing a bursting effect.
Percentage: ***69% potassium perchlorate, 17% hemp coal, 12% sulfur, 2% rich starch***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in small aerial shells, 2 to 3 inches in diameter to burst open the shell. Can also be used in Hollywood style effects to burst apart and ignite gasoline mixtures.

07-06-014C: Standard bursting charge for small aerial shells (utilizing a perchlorate rather then chlorate):
Into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***690 grams of potassium perchlorate,*** followed by ***290 grams of finely powdered hemp coal,*** and then followed by ***20 grams of glutinous rice starch.*** Thereafter, add in 125 milliliters of acetone or ether in the usual manner, and then blend the mixture until the bulk of the acetone or ether evaporates. When this point has been achieved, place the semi-dried mass onto a shallow pan or tray, and then allow it to thoroughly air-dry. Once it has, the dried mass needs to be ball milled using small diameter Teflon coated shot under mild RPM (avoid any significant grinding or bumping) to form a uniform powder. Thereafter, wet the dried powder with a little alcohol to form a paste. This paste can then be rolled into balls, or wrapped into any paper containers, or material in the usual manner, and then allowed to dry. Instead of forming a paste, the dry tumbled powder can be used in loose form if desired, but should be confined in the usual manner, i.e., as in the center of the aerial shell. Readily ignites, but should be primed in the usual manner.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Ignites rapidly, producing a bursting effect.
Percentage: ***69% potassium perchlorate, 29% hemp coal, 2% rich starch***
Classification: Deflagrating explosive (classified as consumer explosive fireworks composition).
Use: Used in moderate aerial shells, 4 to 6 inches in diameter to burst open the shell. Can also be used in Hollywood style effects to burst apart and ignite gasoline mixtures.

07-06-015A: Smokeless flash powder for use in fireworks:
Into a suitable ball mill, filled with 160 grams of Teflon coated steel shot of 10 millimeters in diameter, place ***35 grams of zirconium hydride***, followed by ***35 grams of finely divided magnesium powder***, followed by ***150 grams of barium nitrate***, followed by ***125 grams of barium oxide***, and then tumble the mixture for about 30 minutes at 150 RPM. Thereafter, add in ***25 grams of rice starch***, and then followed by ***140 grams of finely divided zirconium metal***, and then continue to tumble the mixture at 150 RPM for another 30 minutes to form a uniform powder. Thereafter, the mixture is ready for use. To use, the powder can be placed loosely into flash bags, or it can be wetted with a little alcohol to form a paste, and then pressed into any desirable tube, paper cup, ect., and then allowed to dry in the usual manner.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes when ignited and when confined.
Percentage: ***29% barium nitrate, 27% zirconium metal, 26% barium oxide, 7% magnesium, 7% zirconium hydride, 4% rice starch***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in fireworks for the usual means.

07-06-016A: Photo flash composition for use in fireworks, but also for commercial use in flares:
Into a suitable mixing bowl, or blender, in the usual means, equipped with motorized stirrer, place ***200 grams of atomized aluminum*** of 20 microns in size, followed by ***150 grams of potassium perchlorate*** of 24 microns, and then followed by ***150 grams of barium nitrate*** of 150 microns. Thereafter, add in 100 milliliters of alcohol, and then blend the mixture for about 1 hour to form a uniform paste. Thereafter, the mixture is ready for use. To use, it simply needs to be pressed into any container, flare cartridge, paper tube, or rolled into balls, and then allowed to thoroughly air-dry. Should be ignited using a suitable flare ignition composition.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5
Tendency to cake: None.
Explosive ability: May explode if ignited rapidly when confined.
Percentage: ***40% atomized aluminum, 30% potassium perchlorate, 30% barium nitrate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in flares for fireworks, and also in military and commercial flares (used in the M120A1 and M112A1 flare cartridges).

07-06-017A: Purple flash composition for use in fireworks:

Into a suitable mixing bowl, or blender, in the usual means, equipped with motorized stirrer, place ***400 grams of finely powdered magnesium metal***, followed by ***400 grams of potassium perchlorate***, followed by ***120 grams of pulverized copper-II-oxide***, followed by ***120 grams of strontium nitrate,*** and then followed by ***40 grams of finely powdered PVC***. Thereafter, add in 125 milliliters of ether, and then blend the mixture until the bulk of the solvent evaporates. Note: a vacuum can be applied to speed up the evaporation. Thereafter, place the semi-dried mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a ball mill, filled with 250 grams of Teflon coated steel shot of 5 millimeters in diameter, and then tumble the mixture at 200 RPM for about 30 minutes to form a pulverized mass. Thereafter, the mixture is ready for use. To use, it can simply be pressed into containers under 10,000 psi, or it can be used loosely in flash bags or similar containers. If desired, the dry pulverized mixture can be wetted with a small amount of alcohol to form a paste, and the mixture then rolled into balls of any desired size. Should be ignited using a simple ignition composition.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): depends on method of use (if confined…….9)
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: Explodes with a brilliant flash when confined.
Percentage: ***37% magnesium metal, 37% potassium perchlorate, 11% strontium nitrate, 11% copper-II-oxide, 3% PVC, 1% impurities,***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in fireworks for generating brilliant flashes of light.

07-06-018A: Simple yellow flash composition for use in fireworks:
Into a suitable empty ball mill, place ***100 grams of finely divided magnesium metal*** of average commercial microns, and the followed by ***600 grams of anhydrous non-caked sodium nitrate***. Thereafter, add in a little ether or acetone, and then tumble the mixture at 500 RPM until the ether or acetone has evaporated. When the solvent has evaporated, continue to tumble the mixture at 500 RPM for another 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, it simply can be pressed into molds, containers, ect., under high-pressure in the usual way, or it can be used loosely in flash bags, or similar containers.
Burn rate: Burns good.
Water resistance: Poor.
Stability: Can be stored for many years if kept away from moisture.
Flammability (1 to 10): depends on method of use (if confined…….8)
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: Explodes with a brilliant flash when confined.
Percentage: ***86% sodium nitrate, 14% magnesium metal***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in fireworks for generating brilliant flashes of light.

07-06-019A: Classic green flash composition for use in fireworks:
Into a suitable empty ball mill, place ***250 grams of finely divided aluminum metal***, followed by ***150 grams of barium nitrate,*** and then followed by ***300 grams of potassium perchlorate***. Thereafter, add in a little ether or acetone, and then tumble the mixture at 500 RPM until the ether or acetone has evaporated. When the solvent has evaporated, continue to tumble the mixture at 500 RPM for another 15 to 20 minutes. Thereafter, the mixture is ready for use. To use, it simply can be pressed into molds, containers, ect., under high-pressure in the usual way, or it can be used loosely in flash bags, or similar containers.
Burn rate: Burns good.
Water resistance: Poor.
Stability: Can be stored for many years if kept away from moisture.
Flammability (1 to 10): depends on method of use (if confined…….8)
Ease of ignition (1 to 10): 6 ½
Tendency to cake: None.
Explosive ability: Explodes with a brilliant flash when confined.
Percentage: ***43% potassium perchlorate, 36% aluminum metal, 21% barium nitrate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in fireworks for generating brilliant flashes of light.

07-06-020A: Classic priming composition:
Into a suitable mixing bowl, or blender, in the usual means, equipped with motorized stirrer, place ***50 grams of commercially available shellac***, followed by ***50 grams of finely powdered sublimed sulfur***, followed by ***150 grams of potassium nitrate of average micron,*** and then followed by 125 milliliters of hexane, and then blend the mixture for about 30 minutes on moderate speed.

Thereafter, add in ***200 grams of barium nitrate,*** and then continue to blend the mixture for about 10 minutes on moderate speed. Thereafter, place the pasty mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a ball mill, filled with 250 grams of Teflon coated steel shot of 1 millimeter in diameter, and then tumble the mixture at 200 RPM for about 30 minutes to form a pulverized mass. Thereafter, the mixture is ready for use. To use it, the dry mixture should be wetted with a small amount of alcohol to form a gentle paste, which is then rolled, or coated on any desirable star or similar composition, and then allowed to dry. Can be ignited using any means.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Explodes when confined.
Percentage: ***44.44% barium nitrate, 33.33% potassium nitrate, 11.11% sulfur, 11.11% shellac, 0.01% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to prime stars.

07-06-021A: Classic priming composition:

Into a suitable mixing bowl, or blender, in the usual means, equipped with motorized stirrer, place ***150 grams of finely sieved soft wood charcoal,*** followed by ***40 grams of commercial standard red gum,*** followed by ***20 grams of dry dextrin powder,*** followed by ***40 grams of pyrotechnics grade flakes aluminum,*** and then followed by ***90 grams of powdered manganese dioxide,*** and then followed by 125 milliliters of hexane, and then blend the mixture for about 30 minutes on moderate speed. Thereafter, add in ***800 grams of potassium perchlorate,*** and then continue to blend the mixture for about 10 minutes on moderate speed. Thereafter, place the pasty mass onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a ball mill, filled with 150 grams of Teflon coated steel shot of 1 to 2 millimeters in diameter, and then tumble the mixture at 200 RPM for about 30 minutes to form a pulverized mass. Thereafter, the mixture is ready for use. To use it, the dry mixture should be wetted with a small amount of alcohol to form a gentle paste, which is then rolled, or coated on any desirable star or similar composition, and then allowed to dry. Can be ignited using any means.
Burn rate: Rapid.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Explodes when confined.
Percentage: ***70% potassium perchlorate, 13% soft wood charcoal, 8% manganese dioxide, 4% red gum, 4% flaked aluminum, 1% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to prime stars.

07-06-022A: Classic priming composition for use with stars:

Into a suitable empty ball mill, place ***300 grams of dry dextrin powder,*** followed by ***200 grams of air floated soft wood charcoal,*** and then followed by ***90 grams of finely powdered silicon.*** Thereafter, add in a little acetone or hexane, and then tumble the mixture at 200 RPM until the acetone or hexane has evaporated. When the solvent has evaporated, add in 100 grams of steel shot of 1 to 2 millimeters in diameter, and then followed by ***680 grams of potassium perchlorate,*** and then continue to tumble the mixture at 150 RPM for 30 to 40 minutes. Thereafter, the mixture is ready for use. To use, it simply needs to be wetted using a small amount of alcohol to form a paste, and then it simply needs to be rolled or coated onto any star in the usual means.
Burn rate: Average
Water resistance: Typical.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9 (depends on method of preparation).
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Explodes when confined.
Percentage: ***54% potassium perchlorate, 24% dextrin, 16% wood charcoal, 6% silicon***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to prime stars.

07-06-023A: Standard priming composition for strobes, stars, and similar compositions containing ammonium perchlorate:

Into a suitable mixing drum, container, ect., equipped with motorized stirrer, place ***50 grams of potassium dichromate,*** followed by ***60 grams of commercially available hemp coal,*** followed by ***120 grams of Rosin (BL Grade),*** followed by ***30 grams of fine flaked pyrotechnics grade aluminum.*** Thereafter, add in 50 milliliters of ether, and then blend the mixture until the bulk of the ether evaporates. When this point has been achieved, add in ***740 grams of potassium perchlorate,*** followed by 250 milliliters of hexane, and then continue to blend the mixture until the bulk of acetone evaporates. When a semi pasty mass, remains, the mixture is ready for use. To use, the semi wet mixture needs to be rolled onto any desirable star, ect., in the usual manner.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Can explode if confined.
Percentage: ***74% potassium perchlorate, 12% rosin, 6% hemp coal, 5% potassium dichromate, 3% flaked aluminum***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to prime stars.

07-06-024A: Standard priming composition for chlorate stars:

Into a suitable container, equipped with motorized stirrer, place 400 milliliters of cold water, and then dissolve in ***80 grams of potassium nitrate.*** Thereafter, add in ***520 grams of potassium chlorate,*** followed by ***300 grams of fine-grained soft wood charcoal,*** followed by ***100 grams of powdered lampblack,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, add in 400 milliliters of ethyl acetate, and then continue to blend the mixture for about 10 minutes. Thereafter, filter-off the insoluble mass, and then vacuum dry it, or allow it to air dry. Once the mass has dried, place it into a clean beaker or suitable container, equipped with motorized stirrer, and then add in ***50 grams of standard commercially available animal glue,*** and then blend the mixture for about 10 minutes. Thereafter, the mixture is ready for use. To use, it simply needs to be coated or rolled onto any desirable stars. The thickness of the priming layer should be about 1 to 2 millimeters thick. Thereafter, allow the coated stars to cure for 24 hours.
Burn rate: Burns good.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8 to 9
Ease of ignition (1 to 10): 8+
Tendency to cake: None.
Explosive ability: Can explode if confined.
Percentage: ***49.52% potassium chlorate, 28.57% wood charcoal, 9.5% lampblack, 7.61% potassium nitrate, 4.76% animal glue, 0.04% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to prime stars.

07-06-025A: "Electric match" priming composition/device for initiating motors, and rockets:

Into a suitable container, equipped with motorized stirrer, place 200 milliliters of cold water, and then add in ***100 grams of carboxymethylcellulose,*** followed by ***40 grams of finely divided zirconium metal,*** followed by ***40 grams of fine-grained atomized aluminum,*** followed by ***60 grams of 50/50 magnalium alloy*** (commercially available), and then followed by ***60 grams of specialty electronics grade lamp black,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, add in ***320 grams of potassium chlorate,*** and then continue to blend the mixture for about 10 more minutes. Thereafter, add in 200 milliliters of ethyl acetate, and then continue to blend the messy mass for about 10 minutes. Thereafter, filter-off the insoluble mass, and then vacuum dry it, or allow it to air dry. Once the mass has dried, it is ready to use. To use, place the dried mass into a ball mill, filled with 100 grams of Teflon coated steel shot of 1 millimeter in diameter, and then tumble the mixture at 75 RPM for about 30 minutes. Thereafter, the mixture is ready for use. To use, place the powdered material into a clean beaker, and then add in 500 milliliters of warm water, and then blend the mixture to form a uniform dispersion. Now, take a copper wire, and expose the end portions of the wire about 1 inch in length. Then dip this 1 inch exposed length into the mixture, and then allow it to dry at a vertical position. Thereafter, re-dip and dry once more. Now, into a small beaker, or similar container, place 150 milliliters of ethyl acetate, and then add and dissolve 10 grams of nitrocellulose of average nitrogen content. Then dip the dried coated wire into this nitrocellulose mixture several times, allowing the dipped wire to dry each time. Finally, repeat the whole process using another wire (1 inch exposed area) in the same manner as before. Now, to use both wires, both coated and dried wires must be placed side by side so that the compositions on both wires touch each other, but not the metal wires themselves—one wire is negative, one is positive. The electric device is then put into contact with any ignition material for igniting propellants in mortars, or for igniting rocket fuels. The electric match composition is readily ignited using a 12-volt battery.
Burn rate: 0.1 to 0.15 inches per second (average burn).
Water resistance: Very good.

Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***51.61% potassium chlorate, 16.12% carboxymethylcellulose, 9.67% lamp black, 9.67% magnalium alloy, 6.45% atomized aluminum, 6.45% zirconium metal, 0.03% nitrocellulose***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to ignite mortar propellants or rocket fuels using electric current rather then sparks or flame.

07-06-026A: Classic flash charge for use in fireworks and other purposes:
Into a suitable ball mill, filled with 500 grams of light Teflon coated steel shot, place ***1400 grams of potassium perchlorate***, and then add in ***600 grams of dark pyrotechnics grade aluminum powder***. Thereafter, tumble the mixture at 150 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be wetted with inert solvent such as hexane or acetone, and then rolled into stars, or pressed into tablets, or any desired shape. Either way, the materials should be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***70% potassium perchlorate, 30% dark grade aluminum powder***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to generate spectacular flash effects.

07-06-027A: Classic flash charge for use in fireworks and other purposes:
Into a suitable ball mill, filled with 500 grams of light Teflon coated steel shot, place ***600 grams of potassium perchlorate***, and then add in ***600 grams of 400 mesh aluminum powder***, and then ***200 grams of flours of sulfur***. Thereafter, tumble the mixture at 150 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be wetted with inert solvent such as hexane or acetone, and then rolled into stars, or pressed into tablets, or any desired shape. Either way, the materials should be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***42.85% potassium perchlorate, 42.85% aluminum powder, 14.28% sulfur, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to generate spectacular flash effects.

07-06-028A: Classic green flash charge for use in fireworks and other purposes:
Into a suitable ball mill, filled with 250 grams of light Teflon coated steel shot, place ***400 grams of barium nitrate***, and then add in ***200 grams of fine mesh aluminum powder***, and then ***100 grams of flours of sulfur***. Thereafter, tumble the mixture at 250 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be wetted with inert solvent such as hexane or acetone, and then rolled into stars, or pressed into tablets, or any desired shape. Either way, the materials should be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***57.14% barium nitrate, 28.57% aluminum powder, 14.28% sulfur, 0.01% mixed residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to generate spectacular flash effects.

07-06-029A: Classic flash charge for use in fireworks and other purposes:
Into a suitable ball mill, filled with 500 grams of light Teflon coated steel shot, place ***1600 grams of potassium perchlorate***, and then add in ***60 grams of flours of sulfur***, and then followed by ***540 grams of aluminum powder***. Thereafter, tumble the mixture at 250 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be wetted with inert solvent such as hexane or acetone, and then rolled into stars, or pressed into tablets, or any desired shape. Either way, the materials should be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***72.72% potassium perchlorate, 24.54% aluminum powder, 2.72% sulfur, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to generate spectacular flash effects.

07-06-029B: Classic flash charge for use in fireworks and other purposes:
Into a suitable ball mill, filled with 500 grams of light Teflon coated steel shot, place ***1280 grams of potassium perchlorate***, and then add in ***260 grams of flours of sulfur***, and then followed by ***460 grams of aluminum powder***. Thereafter, tumble the mixture at 250 RPM for about 3 hours. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be wetted with inert solvent such as hexane or acetone, and then rolled into stars, or pressed into tablets, or any desired shape. Either way, the materials should be cured in an oven at ordinary temperature in the usual manner.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***64% potassium perchlorate, 23% aluminum powder, 13% sulfur***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to generate spectacular flash effects.

07-06-030A: Classic bursting charge with extra heaving action:
Into a suitable ball mill, filled with 500 grams of heavy Teflon coated steel shot, place ***600 grams of hemp coal***, and then add in ***500 grams of lampblack***. Thereafter, tumble the mixture at 350 RPM for about 2 hours. Thereafter, add in ***1400 grams of potassium perchlorate***, and then continue to tumble the mixture at 350 RPM for an additional 1 hour. Thereafter, add in ***100 grams of potassium dichromate***, and then finally add in ***40 grams of glutinous rice starch***. Thereafter, continue to tumble the mixture at 200 RPM for about 2 hours. Thereafter, place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 450 milliliters of acetone, and then blend the entire mixture on moderate speed to form a uniform dough. Note: more solvent may need to be added. Thereafter, the mixture is ready for use. To use, the mixture needs to be rolled into balls of any desired diameter, for use as cores in aerial shells. The balls should then be cured in an oven at moderate temperature in the usual manner.
Burn rate: Rapid.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Explodes when confined.
Percentage: ***53.03% potassium perchlorate, 22.72% hemp coal, 18.93% lampblack, 3.78% potassium dichromate, 1.51% rice starch, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as explosive).
Use: Used as a bursting charge.

07-06-031A: Priming composition with permanganate oxidizer:
Into a suitable mixing bowl, equipped with motorized stirrer, place 100 milliliters of hexane (do not use alcohol), and then add in ***470 grams of iron powder***, and then followed by ***540 grams of potassium permanganate***. Thereafter, blend the entire mixture on moderate speed to form a uniform dough. Thereafter, place the material onto a shallow pan or tray, and then allow it to thoroughly air

dry. Once it is, place the dried mixture into a suitable ball mill, filled with 300 grams of light Teflon coated steel shot, and then tumble the mixture at 75 RPM for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture should be slightly wetted, and then rolled onto stars to form a light coating. The mixture can also be pressed into tablets or similar shapes if desired under pressure for any desired purpose. In either case, allow the priming mixture to air-dry (if wetted).

Burn rate: Rapid.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: May explode under certain conditions—percussion, ect.,

Percentage: ***53.46% potassium permanganate, 46.53% potassium permanganate, 0.01% residual balance***

Classification: Deflagrating explosive (classified as explosive).

Use: Used to prime stars and other compositions.

Section 7: Miscellaneous Compositions

- Miscellaneous Compositions in this section -

1. 07-07-001A: Classic magnesium flare composition for various uses: *36% magnesium, 23% potassium perchlorate, 23% barium nitrate, 13% PVC, 5% polyester resin*	**2. 07-07-001B: Classic green torch composition for various uses:** *41.6% barium chlorate, 33.33% barium nitrate, 16.66% calomel, 8.33% shellac, 0.08% impurities*
3. 07-07-001C: Classic green torch composition for various uses (with increased burn rate): *83.33% barium nitrate, 12.5% K.D. gum, 2% ammonium chloride, 2% potassium chlorate, 0.17% impurities*	**4. 07-07-001D: Classic blue torch composition for various uses:** *55.55% potassium perchlorate, 22.22% copper acetoarsenite, 11.11% dextrin, 11.11% calomel, 0.01% mixed residue*
5. 07-07-001E: Classic blue torch composition for various uses (with increased combustion rate): *58.5% potassium perchlorate, 21.9% sulfur, 14.6% copper ammonium sulfate, 4.8% lactose, 0.2% residues*	**6. 07-07-001F: Classic blue torch composition for various uses (fortified with asphaltum):** *72.7% potassium perchlorate, 18.18% copper ammonium chloride, 6% stearin, 3% asphaltum, 0.12% impurities*
7. 07-07-001G: Classic purple torch composition for various uses: *30% potassium perchlorate, 23.33% strontium nitrate, 20% copper-II-oxide, 16.66% sulfur, 10% calomel, 0.01% mixed balance*	**8. 07-07-001H: Classic amber torch composition for various uses:** *58% strontium nitrate, 16.12% potassium perchlorate, 12.9% sodium oxalate, 8% shellac, 4.83% sulfur, 0.15% mixed*
9. 07-07-002A: Classic "aluminum" white torch composition for various uses: *52% potassium perchlorate, 24% aluminum powder, 20% flaked aluminum, 4% dextrin*	**10. 07-07-003A: Classic whistle composition for use in bottle rockets, and ground devices:** *72.54% potassium perchlorate, 27.5% sodium salicylate*
11. 07-07-004A: Classic whistle mixture for use in bottle rockets and ground devices: *70% potassium perchlorate, 30% sodium benzoate*	**1207-07-005A: Advanced whistle mixture for use in bottle rockets and ground devices:** *39.98% potassium chlorate, 29.98% potassium nitrate, 9.99% paraffin oil, 9.99% sodium salicylate, 9.99% sodium chlorate, 0.0499% red iron oxide, 0.201% residue*
13. 07-07-006A: Classic whistle mixture for use in bottle rockets and ground devices: *75% potassium chlorate, 25% gallic acid*	**14. 07-07-007A: Delay composition used in stars:** *60% barium chromate, 26% zirconium/nickel alloy, 14% potassium perchlorate*
15. 07-07-007B: Changing relay composition used in stars: *35% potassium nitrate, 35% potassium perchlorate, 24% hemp coal, 6% glutinous rice starch*	**16. 07-07-008A: Pyrotechnic composition for generating snakes (Pharaoh snakes):** *93.75% mercuric thiocyanate, 4.6875% "dragant", 1.5625% gum Arabic binder*
17. 07-07-009A: Classic magnesium flare: *55.55% magnesium, 38.88% sodium nitrate, 5.55% laminac, 0.02% impurities*	**18. 07-07-010A: Classic green torch composition:** *37.5% potassium perchlorate, 31.25% barium nitrate, 18.75% sulfur, 12.5% guar gum*
19. 07-07-011A: Interesting "whistle" composition: *70% potassium dinitrophenate, 30% potassium nitrate*	**20. 07-07-012A: Delay composition for stars, rockets, and other purposes:** *90% barium chromate, 10% boron*
21. 07-07-013A: Changing relay composition for use in stars: *81% potassium perchlorate, 13% red gum, 6% glutinous rice starch*	**22. 07-07-014A: Alternative fire dust composition:** *81% potassium perchlorate, 13% red gum, 6% glutinous rice starch,*
23. 07-07-015A: Reverse incendiary agent for use in ignition compositions: *80% lead tetraoxide, 20% ferro/silicon alloy*	**24. 07-07-016A: Specialty loud whistling compound for fireworks:** *75% picric acid, 25% potassium nitrate (99% picric acid potassium salt complex)*
25. 07-07-017A: Specialty whistling compound for fireworks: *65.42% potassium nitrate, 18.69% picric acid, 4.67% magnesium carbonate, 4.67% animal glue, 3.73% black powder, 2.8% Paris green, 0.02% residual balance*	

07-07-001A: Classic magnesium flare composition for various uses:

Into a suitable empty ball mill, place ***175 grams of standard magnesium*** powder, followed by 15 milliliters of linseed oil. Thereafter, tumble the mixture on low RPM for about 10 minutes to coat the magnesium with linseed oil. Thereafter, place this coated magnesium into a suitable mixing drum, or bowl, equipped with a motorized stirrer in the usual means, followed by ***65 grams of fine grained PVC,*** followed by ***25 grams of any standard polyester resin (fine grained)***, followed by ***112.5 grams of barium nitrate,*** and then followed by ***112.5 grams of potassium perchlorate.*** Thereafter, add in about 175 milliliters of ether or acetone, and then blend the mixture for about 15 minutes to form a paste. Thereafter, place the mixture onto a shallow pan or tray, and allow the mixture to thoroughly dry. Once it has, place the dried mass into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of the usual manner, and then tumble the mixture for about 30 minutes at 200 RPM to form a uniform powder. Thereafter, the mixture is ready for use. To use, the dried mixture simply needs to be pressed into any cone, fountain, mold, or any suitable tube, body, ect, under a pressure of about 10,000 psi, in the usual manner.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***36% magnesium, 23% potassium perchlorate, 23% barium nitrate, 13% PVC, 5% polyester resin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating large amounts of lighting effects.

07-07-001B: Classic green torch composition for various uses:
Into a suitable empty ball mill, place ***200 grams of standard calomel compound***, followed by ***100 grams of shellac,*** followed by ***400 grams of barium nitrate***, and then followed by ***500 grams of barium chlorate.*** Thereafter, add in about 175 milliliters of alcohol, and then blend the mixture until the bulk of the alcohol evaporates. Note: a vacuum can be applied to speed up the evaporation. Thereafter, the mixture is ready for use. To use, the moistened mixture simply needs to be pressed into any cone, fountain, mold, or any suitable tube, body, ect, under a mild pressure, in the usual manner, and then allowed to dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***41.6% barium chlorate, 33.33% barium nitrate, 16.66% calomel, 8.33% shellac, 0.08% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating slow burning fire effects

07-07-001C: Classic green torch composition for various uses (with increased burn rate):
Into a suitable empty ball mill, place ***50 grams of standard ammonium chloride,*** followed by ***300 grams of commercially available K.D. gum,*** followed by ***50 grams of potassium chlorate***, and then followed by ***2000 grams of barium nitrate.*** Thereafter, add in about 500 milliliters of hexane, and then tumble the mixture at 150 RPM until the bulk of the hexane evaporates. Note: a vacuum can be applied to speed up the evaporation, and is preferred. Thereafter, the mixture is ready for use. To use, the moistened mixture simply needs to be pressed into any cone, fountain, mold, or any suitable tube, body, ect, under a mild pressure, in the usual manner, and then allowed to dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 to 6 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***83.33% barium nitrate, 12.5% K.D. gum, 2% ammonium chloride, 2% potassium chlorate, 0.17% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating brilliant burning fire effects.

07-07-001D: Classic blue torch composition for various uses:
Into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual means, place ***100 grams of calomel***, followed by ***200 grams of copper acetoarsenite*** (Paris green), followed by ***100 grams of dry dextrin***, and then add in 100 milliliters of ether. Thereafter, blend the mixture for about 5 minutes. Note: wear gloves when handling copper acetoarsenite, which is highly toxic). Thereafter, add in ***500 grams of potassium perchlorate***, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing. To do so, simply press it under mild pressure into any cone, fountain, mold, tube, container, ect., in the usual manner, and then allow the devices to dry at room temperature, or in an oven at low heat. Vacuum can be applied, and is preferred.
Burn rate: Unknown.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.

Explosive ability: None.
Percentage: ***55.55% potassium perchlorate, 22.22% copper acetoarsenite, 11.11% dextrin, 11.11% calomel, 0.01% mixed residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating brilliant burning fire effects.

07-07-001E: Classic blue torch composition for various uses (with increased combustion rate):
As before, into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual means, place ***90 grams of flours of sulfur***, followed by ***20 grams of lactose***, followed by ***60 grams of copper ammonium sulfate***, and then add in 100 milliliters of ether. Thereafter, blend the mixture for about 5 minutes. Thereafter, add in ***240 grams of potassium perchlorate***, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing. To do so, simply press it under mild pressure into any cone, fountain, mold, tube, container, ect., in the usual manner, and then allow the devices to dry at room temperature, or in an oven at low heat. Vacuum can be applied, and is preferred.
Burn rate: Unknown.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 (based on burn rate).
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58.5% potassium perchlorate, 21.9% sulfur, 14.6% copper ammonium sulfate, 4.8% lactose, 0.2% residues***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating brilliant burning fire effects.

07-07-001F: Classic blue torch composition for various uses (fortified with asphaltum):
As before, into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual means, place ***20 grams of asphaltum***, followed by ***40 grams of stearin***, followed by ***120 grams of copper ammonium chloride***, and then add in 100 milliliters of ether. Thereafter, blend the mixture for about 5 minutes. Thereafter, add in ***480 grams of potassium perchlorate***, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing. To do so, simply press it under mild pressure into any cone, fountain, mold, tube, container, ect., in the usual manner, and then allow the devices to dry at room temperature, or in an oven at low heat. Vacuum can be applied, and is preferred.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.7% potassium perchlorate, 18.18% copper ammonium chloride, 6% stearin, 3% asphaltum, 0.12% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating brilliant burning fire effects.

07-07-001G: Classic purple torch composition for various uses:
Into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, place ***100 grams of flours of sulfur***, followed by ***60 grams of calomel***, followed by ***120 grams of copper-II-oxide***, and then add in 100 milliliters of acetone, and then blend the mixture for about 15 minutes. Thereafter, add in ***180 grams of potassium perchlorate***, and then followed by ***140 grams of strontium nitrate***, and then continue to blend the mixture for about 30 minutes to form a mild paste. Thereafter, place the mass onto a shallow pan or tray, and allow it to thoroughly air dry. Thereafter, place the dried mass into a clean ball mill, filled with 200 grams of Teflon coated steel shot in the usual diameter, and then tumble the mixture for about 1 hour at 200 RPM to form a uniform powder. Thereafter, the mixture is ready for use. To use, simply press the mixture into any cone, fountain, tube, container, ect., in the usual manner under high pressure, say about 10,000 psi. The mixture is then readily ignited.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***30% potassium perchlorate, 23.33% strontium nitrate, 20% copper-II-oxide, 16.66% sulfur, 10% calomel, 0.01% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Used in fireworks for generating brilliant burning fire effects.

07-07-001H: Classic amber torch composition for various uses:
Into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, place ***60 grams of flours of sulfur***, followed by ***100 grams of shellac***, followed by ***160 grams of sodium oxalate***, and then add in 250 milliliters of acetone, and then blend the mixture for about 15 minutes. Thereafter, add in ***200 grams of potassium perchlorate***, and then followed by ***720 grams of strontium nitrate***, and then continue to blend the mixture for about 30 minutes to form a mild paste. Thereafter, place the mass onto a shallow pan or tray, and allow it to thoroughly air dry. Thereafter, place the dried mass into a clean ball mill, filled with 200 grams of Teflon coated steel shot in the usual diameter, and then tumble the mixture for about 1 hour at 200 RPM to form a uniform powder. Thereafter, the mixture is ready for use. To use, simply press the mixture into any cone, fountain, tube, container, ect., in the usual manner under high pressure, say about 10,000 psi. The mixture is then readily ignited.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 on average, may burn at 6 depending on degree of pressing.
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***58% strontium nitrate, 16.12% potassium perchlorate, 12.9% sodium oxalate, 8% shellac, 4.83% sulfur, 0.15% mixed***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating brilliant burning fire effects.

07-07-002A: Classic "aluminum" white torch composition for various uses:
As before, into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, place ***50 grams of dextrin***, followed by ***250 grams of flaked aluminum*** (commercial standard grade), followed by ***300 grams of aluminum powder*** of average mesh, and then add in 250 milliliters of acetone, and then blend the mixture for about 15 minutes. Thereafter, add in ***650 grams of potassium perchlorate***, and then continue to blend the mixture for about 30 minutes to form a mild paste. Thereafter, place the mass onto a shallow pan or tray, and allow it to thoroughly air dry. Thereafter, place the dried mass into a clean ball mill, filled with 200 grams of Teflon coated steel shot in the usual diameter, and then tumble the mixture for about 1 hour at 200 RPM to form a uniform powder. Thereafter, the mixture is ready for use. To use, simply press the mixture into any cone, fountain, tube, container, ect., in the usual manner under high pressure, say about 10,000 psi. The mixture should be ignited using any ignition composition.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52% potassium perchlorate, 24% aluminum powder, 20% flaked aluminum, 4% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating brilliant burning fire effects.

07-07-003A: Classic whistle composition for use in bottle rockets, and ground devices:
Into a suitable horizontal ball mill, filled with 250 grams of Teflon coated steel shot of 1 millimeter in diameter, and then add in ***362.5 grams of potassium perchlorate***, and then followed by ***137.5 grams of sodium salicylate***. Thereafter, rotate the ball mill at 250 RPM for about 2 hours to form a uniform mixture. Thereafter, place the rotated mixture into a suitable mixing bowl, equipped with motorized stirrer, or blender, and then add in 150 milliliters of dry hexane, and then blend the mixture on moderate speed for about 15 to 20 minutes. Thereafter, the pasty mass is ready for use. To use, the paste needs to be pressed under high pressure into any desirable rocket motor, container, tube, mold, ect., and then allow the devices to thoroughly cure for several days or so.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6 (depends on the amount of pressure used to press the mixture).
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***72.54% potassium perchlorate, 27.5% sodium salicylate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating loud whistling sound.

07-07-004A: Classic whistle mixture for use in bottle rockets and ground devices:
Into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, place ***350 grams of potassium perchlorate***, and then followed by ***150 grams of sodium benzoate***. Thereafter, add in 150 milliliters of hexane, and then blend the mixture for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure into any cone, tube, container, mold, or bottle rocket in the usual manner, and then allow the devices to cure for several days at room temperature.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6 (depends on pressed composition—loose composition may not whistle very well).
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% potassium perchlorate, 30% sodium benzoate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating loud whistling effects.

07-07-005A: Advanced whistle mixture for use in bottle rockets and ground devices:
Into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, place 250 milliliters of hexane, followed by ***200 grams of paraffin oil***, followed by ***200 grams of sodium salicylate,*** followed by ***200 grams of sodium chlorate,*** and then blend the mixture on moderate speed for about 30 minutes. Thereafter, add in ***800 grams of potassium chlorate,*** followed by ***600 grams of potassium nitrate,*** and then followed by ***1 gram of red iron-III-oxide,*** and then continue to blend the mixture for about 30 minutes. Thereafter, place the blended mass onto a shallow tray or pan, and allow it to thoroughly air-dry. Once it has, place the dried mass into a suitable ball mill, filled with small diameter Teflon coated steel shot, and then tumble the mixture on low RPM for about 1 hour. Finally, the mixture is ready for use. To use, the composition simply needs to be pressed under high pressure into any cone, tube, container, mold, or bottle rocket in the usual manner.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6 (depends on pressed composition—loose composition may not whistle very well).
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.98% potassium chlorate, 29.98% potassium nitrate, 9.99% paraffin oil, 9.99% sodium salicylate, 9.99% sodium chlorate, 0.0499% red iron oxide, 0.201% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating loud whistling effects.

07-07-006A: Classic whistle mixture for use in bottle rockets and ground devices:
Into a suitable mixing bowl, or blender, equipped with motorized stirrer in the usual manner, place ***375 grams of potassium chlorate***, and then followed by ***125 grams of gallic acid.*** Thereafter, add in 150 milliliters of methylene chloride, and then blend the mixture for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure into any cone, tube, container, mold, or bottle rocket in the usual manner, and then allow the devices to cure for several days at room temperature.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***75% potassium chlorate, 25% gallic acid***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for generating loud whistling effects.

07-07-007A: Delay composition used in stars:
Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***140 grams of potassium perchlorate***, followed by ***260 grams of powdered zirconium/nickel alloy*** containing 50% zirconium and 50% nickel, and then followed by ***600 grams of barium chromate***. Thereafter, tumble the mixture at 300 RPM for about 1 hour to form a uniform powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be wetted with a little alcohol to form a paste, and then the coat

the desired star (before the star is completely formed), and then allow the composition to dry. The layer can be 1 to 10 millimeters thick.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***60% barium chromate, 26% zirconium/nickel alloy, 14% potassium perchlorate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in stars—this composition is put between two layers in a star.

07-07-007B: Changing relay composition used in stars:

Into a suitable ball mill, filled with 150 grams of Teflon coated steel shot of 5 millimeters in diameter, place ***60 grams of glutinous rice starch***, followed by ***240 grams of hemp coal***, followed by ***350 grams of potassium nitrate***, and then tumble the mixture at 250 RPM for about 1 hour to form a uniform powder. Thereafter, add in ***350 grams of potassium perchlorate,*** and then continue to tumble the mixture at 250 RPM for another hour. Thereafter, the mixture is ready for use. To use, the mixture needs to be wetted with a little alcohol to form a paste, and then coated on the desired star (between the various layers of the star), and then allow the composition to dry. The layer can be 1 to 10 millimeters thick.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 to 6
Ease of ignition (1 to 10): 8
Tendency to cake: None.
Explosive ability: None.
Percentage: ***35% potassium nitrate, 35% potassium perchlorate, 24% hemp coal, 6% glutinous rice starch***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in stars—this composition is put between two layers in a star.

07-07-008A: Pyrotechnic composition for generating snakes (Pharaoh snakes):

Into a large suitable beaker or container, place 2000 milliliters of cold water, and then add and dissolve 335 grams of dry mercuric nitrate. Thereafter, into a separate large beaker, add 1000 milliliters of cold water, and then add and dissolve 180 grams of potassium thiocyanate. Thereafter, gently combine both solutions, and then stir the mass for about 10 minutes. After 10 minutes, filter-off the precipitated mass, wash with water several times, and then vacuum dry or air-dry the washed mass. Now, into a suitable mixing bowl, equipped with a motorized stirrer, place ***300 grams of the dried products obtained before***, followed by ***15 grams of "Dragant"***, and then followed by ***5 grams of gum Arabic***. Thereafter, add in 75 milliliters of acetone, and then blend the mixture until the bulk of the acetone evaporates. Once that point has been achieved, the mixture is ready for use. To use, the semi-dry mass needs to be pressed into molds or pellet shapes ranging from 5 to 15 millimeters in diameter by 5 to 15 millimeters in thickness under high pressure, and then the pressed pellets needs to be dried for 24 hours or more.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***93.75% mercuric thiocyanate, 4.6875% "dragant", 1.5625% gum Arabic binder***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in snakes to produce voluminous snaky/winding ash tails.
Note: numerous modifications to this process exist.

07-07-009A: Classic magnesium flare:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***700 grams of sodium nitrate***, followed by ***100 grams of laminac***, and then followed by ***1000 grams of standard commercially available magnesium powder***. Thereafter add in 400 milliliters of hexane, and then blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture should be pressed into tablets, rolled into stars of any desired diameter, or pressed into tubes, containers, or any desired material in the usual manner.
Burn rate: Typical.

Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55.55% magnesium, 38.88% sodium nitrate, 5.55% laminac, 0.02% impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making bright light effects.

07-07-010A: Classic green torch composition:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***600 grams of sulfur***, followed by ***400 grams of guar gum***, followed by ***1000 grams of barium nitrate***, and then followed by ***1200 grams of potassium perchlorate.*** Thereafter add in 600 milliliters of acetone, and then blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture should be pressed into tablets, rolled into stars of any desired diameter, or pressed into tubes, containers, or any desired material in the usual manner.
Burn rate: Typical.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 4
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***37.5% potassium perchlorate, 31.25% barium nitrate, 18.75% sulfur, 12.5% guar gum***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making flares for the usual purposes.

07-07-011A: Interesting "whistle" composition:

Into a suitable ball mill, filled with 300 grams of heavy Teflon coated steel shot, place ***1400 grams of potassium dinitrophenate***, and then followed by ***600 grams of potassium nitrate***. Thereafter, add in 150 milliliters of acetone, and then tumble the mixture at 100 RPM for about 2 hours. Thereafter, place this mixture into a suitable mixing drum or similar container, equipped with motorized stirrer, and then add in 350 milliliters of acetone, and then blend the mixture on moderate speed for about 1 hour. Thereafter, the mixture is ready for use. To use, the mixture should be pressed into rockets of the desired size, and then cure the rockets in an oven at moderate temperature.
Burn rate: 0.05 to 0.15 inches per second at 100 psi.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 8
Ease of ignition (1 to 10): 7 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***70% potassium dinitrophenate, 30% potassium nitrate***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for whistling rockets.

07-07-012A: Delay composition for stars, rockets, and other purposes:

Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 300 milliliters of acetone, and then add in ***900 grams of barium chromate***, and then followed by ***100 grams of finely powdered boron***. Thereafter, blend the mixture for about 45 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply press it into any desired shape for any desired purpose, or insert an electrical bridge wire into a small sample for use in electric igniters. In either case, the dough should be cured in an oven at moderate temperature in the usual manner.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: May explode under extreme conditions, but not likely.
Percentage: ***90% barium chromate, 10% boron***
Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Used in electric igniters, and for delays in smoke devices and other devices.

07-07-013A: Changing relay composition for use in stars:
Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 500 milliliters of hexane, and then add in ***120 grams of glutinous rice starch***, followed by ***260 grams of red gum***, and then followed by ***1620 grams of potassium perchlorate***. Thereafter, blend the mixture for about 45 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply press it into any desired shape for any desired purpose, or insert an electrical bridge wire into a small sample for use in electric igniters. In either case, the dough should be cured in an oven at moderate temperature in the usual manner.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***81% potassium perchlorate, 13% red gum, 6% glutinous rice starch***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Place between two layers of star composition to change effects.

07-07-014A: Alternative fire dust composition:
Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 500 milliliters of hexane, and then add in ***120 grams of glutinous rice starch***, followed by ***260 grams of red gum***, and then followed by ***1620 grams of potassium perchlorate***. Thereafter, blend the mixture for about 45 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply press it into any desired shape for any desired purpose, or insert an electrical bridge wire into a small sample for use in electric igniters. In either case, the dough should be cured in an oven at moderate temperature in the usual manner.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***81% potassium perchlorate, 13% red gum, 6% glutinous rice starch***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used to create large fire spreads of sparks.

07-07-015A: Reverse incendiary agent for use in ignition compositions:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***1600 grams of lead tetraoxide***, and then add in ***400 grams of powdered ferro/silicon alloy***. Thereafter, tumble the mixture at 500 RPM for about 3 hours. Thereafter, the composition is ready for use. To use, the mixture simply needs to pressed into tablets or pellets under high pressure in the usual manner. Use a magnesium based ignition composition for proper burn.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***80% lead tetraoxide, 20% ferro/silicon alloy***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to ignite "difficult to ignite" compositions.

07-07-016A: Specialty loud whistling compound for fireworks:
Into a very large suitable beaker, or similar container, equipped with motorized stirrer, place 2340 milliliters of warm water, and then add and dissolve ***30 grams of picric acid***. Thereafter, boil the mixture at 100 Celsius. In the meantime, into a second beaker or similar container, place 30 milliliters of warm water, and then add and dissolve ***10 grams of potassium nitrate***. Thereafter, once the picric acid solution begins to boil, slowly add in, in small portions at a time, the potassium nitrate solution, while rapidly blending the picric acid mixture. After the addition of the potassium nitrate, continue to boil and stir the whole mixture for about 10 to 15 minutes. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Now, add in 2000 milliliters of acetone, and then continue to blend the whole mixture for about 15 minutes. Thereafter, filter-off the insoluble mass, and then vacuum dry or air-dry it. Note: the acetone can be recovered by distillation or some other means. Once the filtered-off mass has been dried, it should be ball milled for about 30 minutes to finely grind it, and then it needs to be pressed into tubes of any desired diameter under a pressure of 15,000 psi. Note: if the pressing is not high enough, the whistling noise, and the loudness thereof may be compromised.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***75% picric acid, 25% potassium nitrate (99% picric acid potassium salt complex)***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to make loud whistling fireworks.

07-07-017A: Specialty whistling compound for fireworks:
Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, place ***100 grams of picric acid***, followed by ***350 grams of potassium nitrate***, followed by ***25 grams of magnesium carbonate***, followed by ***25 grams of standard animal glue***, followed by ***15 grams of Paris green***, and then followed by ***20 grams of black powder***. Thereafter, tumble the mixture at 100 RPM for about 45 minutes. Thereafter, place this tumbled mixture into a suitable beaker, or similar container, equipped with motorized stirrer, and then add in 750 milliliters of warm water. Thereafter, boil the mixture at 100 Celsius with constant stirring for about 20 minutes. Thereafter, remove the heat source, and allow the mixture to cool to room temperature. Thereafter, place the mixture into a pressing machine, or equivalent, and press-out the water. Thereafter, the mixture needs to be placed onto a shallow pan or tray, and allowed to thoroughly air-dry. Once it has, the mixture needs to be ball milled, or equivalent, to reduce the dried mass to a fine powder. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into tubes of any desired diameter under a pressure of 15,000 psi.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): Unknown.
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***65.42% potassium nitrate, 18.69% picric acid, 4.67% magnesium carbonate, 4.67% animal glue, 3.73% black powder, 2.8% Paris green, 0.02% residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used to whistling fireworks with report.

Section 8: ADN Test Compositions for Fireworks

- ADN Compositions in this section -

1. 07-08-001A: Moderate velocity rocket propellant: *51.42% ADN, 40% potassium salicyclate, 8.57% aluminum powder, 0.01% mixed residual balance*	**2. 07-08-002A: General-purpose ADN Propellant:** *43.47% ADN, 28.26% ammonium perchlorate, 13.04% aluminum powder, 8.15% Teflon, 5.43% Epoxy resin, 1.63% copper chromite burn catalyst, 0.02% mixed balance*
3. 07-08-003A: Moderate performance propellant: *46.51% ADN, 22.09% asphaltum, 13.95% sodium nitrite, 10.46% magnesium powder, 6.97% boron, 0.02% mixed balance*	**4. 07-08-004A: Star pyrotechnic composition:** *48.07% ADN, 36.53% barium chlorate, 15.38% shellac, 0.02% balance*
5. 07-08-005A: Pyrotechnic star mixture for aerial fireworks: *57.83% ADN, 24.09% magnesium powder, 18.07% PVC, 0,01% mixed balance*	**6. 07-08-006A: Star composition for aerial fireworks:** *48.78% ADN, 26.82% magnesium, 18.29% PVC powder, 6.09% copper-II-chloride, 0,02% mixed residual balance*
7. 07-08-007A: Star composition for aerial fireworks: *40.33% ADN, 26.89% barium nitrate, 11.76% red gum, 10.08% parlon compound, 5.04% dextrin, 4.2% sulfur, 1.68% wood charcoal, 0.02% balance*	**8. 07-08-008A: Star composition for aerial fireworks:** *56.6% ADN, 18.86% copper-II-oxide, 16.03% sulfur, 5.66% shellac, 2.83% dextrin binder, 0.02% residue*
9. 07-08-009A: Star composition with bushy flame: *62.5% ADN, 18.75% PVC, 9.375% copper-II-oxide, 9.375% red phosphorus*	**10. 07-08-010A: Brilliant star composition for aerial use:** *39.73% meal powder, 36.42% ADN, 15.89% sulfur, 6.62% wood charcoal, 1.32% rosin, 0.02% balance*
11. 07-08-011A: Brilliant star composition for aerial use (fortified with dextrin): *70% ADN, 10% shellac, 10% cryolite synthetic mineral, 10% PVC*	**12. 07-08-012A: Brilliant star composition for multiple purposes:** *40.72% ADN, 20.36% gray aluminum powder, 11.31% flake aluminum, 8.59% magnesium oxalate, 8.14% dextrin, 6.33% charcoal, 4.52% sulfur, 0.03% mixed residual balance*
13. 07-08-013A: Star composition for multiple purposes (lampblack special): *28.84% ADN, 28.84% lampblack, 24.03% charcoal, 8.65% barium peroxide, 4.8% dextrin, 4.8% shellac, 0.04% balance*	**14. 07-08-014A: Star composition for multiple purposes:** *44.44% ADN, 14.81% sulfur, 14.81% coarse aluminum, 11.11% antimony sulfide, 7.4% aluminum powder, 7.4% black powder, 0.03% residues*
15. 07-08-015A: Star composition for multiple purposes: *51.36% ADN, 21.85% soft wood charcoal, 10.38% antimony trisulfide, 6.55% glucose, 4.91% sulfur, 4.91% aluminum, 0.04% mixed balance*	**16. 07-08-016A: Star composition for multiple purposes:** *49.38% ADN, 29.62% soft wood charcoal, 11.11% sucrose, 9.87% sodium sulfide, 0.02% mixed balance*
17. 07-08-017A: Brilliant star composition with silver tail: *47.61% ADN, 47.61% coarse aluminum, 4.76% rice starch, 0.02% balance*	**18. 07-08-018A: Beautiful fire dust star composition:** *49% ADN, 40% sulfur, 6% boron, 5% copper-I-chloride anhydrous*
19. 07-08-019A: Brilliant strobe star: *23.47% sodium chlorate, 18.77% ADN, 16.43% magnesium powder, 14.08% sulfur, 8.45% magnalium 50/50 alloy, 8.21% copper-II-oxide, 3.75% phosphorus pentasulfide, 2.34% hexachloroethane, 2.34% potassium peroxide, 2.11% nitrocellulose, 0.05% mixed residual balance*	**20. 07-08-020A: Brilliant strobe star:** *32.03% ADN, 26.21% sulfur, 11.65% magnalium alloy, 10.67% hexachloroethane, 6.79% barium nitrate, 4.85% sodium oxalate, 4.85% antimony pentasulfide, 2.91% nitrocellulose, 0.04% mixed balance*
21. 07-08-021A: Smoke strobe star: *44.9% ADN, 44.9% red phosphorus, 5.55% rice starch, 2.77% realgar, 1.85% soft wood charcoal, 0.03%% mixed balance*	**22. 07-08-022A: Smoke composition for use in fireworks:** *44.82% dye agent, 20.68% ADN, 13.79% lactose, 10.34% copper sulfide, 10.34% potassium chlorate, 0.03% residual balance*
23. 07-08-023A: Smoke composition: *47.05% ADN, 23.52% PVC, 19.6% hexachlorobenzene, 9.8% Teflon, 0.03% mixed balance*	**24. 07-08-024A: ADN/Urea-formaldehyde composition for fountains/cones:** *54.54% ADN, 23.63% urea-formaldehyde resin, 16.36% aluminum, 5.45% magnesium oxalate, 0.02% mixed balance*
25. 07-08-025A: Standard fountain composition: *52.17% ADN, 39.13% aluminum powder, 4.34% meal powder, 4.34% potassium nitrate, 0.02% mixed balance*	**26. 07-08-026A: Bengal light composition:** *48.24% ADN, 21.92% charcoal, 17.54% barium peroxide, 7.89% aluminum powder, 4.38% aluminum oxide, 0.03% mixed impurities*
27. 07-08-027A: Sparkler composition: *53.57% aluminum grains, 35.71% ADN, 6.69% shellac, 4.01% coarse iron, 0.02% mixed balance*	**28. 07-08-028A: Fountain composition for use in fountains and other purposes:** *26.31% ADN, 17.54% meal powder, 15.78% potassium oxide, 15.78% aluminum powder, 15.78% soft wood charcoal, 8.77% sulfur, 0.04% mixed balance*
29. 07-08-029A: Fire composition with multiple uses: *55.94% ADN, 17.48% meal powder, 13.98% orange shellac product, 6.29% ammonium perchlorate, 6.29% coarse iron grains, 0.02% mixed residual balance*	**30. 07-08-030A: Sparkler composition for different uses:** *63.63% ADN, 13.63% sulfur, 13.63% charcoal, 9.09% aluminum flake, 0.02% mixed balance*
31. 07-08-031A: Sparkler composition: *50% ADN, 35% aluminum powder, 15% dextrin*	**32. 07-08-032A: Pyrotechnic composition for use in cones and other devices:** *37.03% ADN, 25.92% antimony trisulfide, 14.81% phosphorus sesquisulfide, 11.11% magnesium peroxide, 7.4% iron-III-oxide, 3.7% chromium trioxide, 0.03% mixed balance*

07-08-001A: Moderate velocity rocket propellant:
Into a suitable mixing bowl, blender, or similar container, equipped with motorized stirrer utilizing a plastic stir blade, place ***350 grams of potassium salicyclate***, followed by ***75 grams of aluminum powder***, followed by 200 milliliters of acetone, and then followed by ***450 grams of ADN***, and then blend the entire mixture at moderate speed until the bulk of the acetone evaporates leaving behind a pasty mass. Thereafter, in the usual fashion, place the pasty mass onto a shallow pan, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean ball mill, filled with the usual amount of Teflon coated steel shot of the usual diameter and weight, and then tumble the mixture at 150 RPM for about 30 minutes to form a uniform powder. Once a uniform powder has been formed, it is ready for use. To use, it simply needs to be pressed into any desirable rocket or mold under a pressure of about 10,000 psi.
Burn rate: Above moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 9
Ease of ignition (1 to 10): 9
Tendency to cake: None.
Explosive ability: Cannot be detonated under normal conditions.
Percentage: ***51.42% ADN, 40% potassium salicyclate, 8.57% aluminum powder, 0.01% mixed residual balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Used in fireworks, and homemade rockets for hobbyists and/or enthusiasts.
Note: the ADN can be replaced with KDN if desired.

07-08-002A: General-purpose ADN Propellant:
Into a suitable mixing drum or similar container, equipped with motorized stirrer, place ***260 grams of ammonium perchlorate***, and then add in ***75 grams of Teflon powder***, and then add in 100 milliliters of hexane. Thereafter, blend the mixture until the hexane evaporates. A vacuum can be used to speed up the process if desired. Thereafter, add in ***15 grams of copper-II-chromite,*** followed by ***400 grams of ADN,*** followed by ***120 grams of aluminum powder***, and then followed by ***50 grams of epoxy resin liquid***, and then continue to blend the mixture in the absence of air for about 45 minutes. Thereafter, press the mixture into any desired rocket motor, engine, ect., in the usual manner, and then cure the motors in an oven at moderate temperature until dry and hard.
Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): Typical.
Tendency to cake: None.
Explosive ability: Can only be detonated under influence from high explosives.
Percentage: ***43.47% ADN, 28.26% ammonium perchlorate, 13.04% aluminum powder, 8.15% Teflon, 5.43% Epoxy resin, 1.63% copper chromite burn catalyst, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Used for making rockets for multiple uses.
Note: the ADN can be replaced with KDN if desired.

07-08-003A: Moderate performance propellant:
Into a large beaker or similar container, equipped with motorized stirrer, place 250 milliliters of hexane, and then add in ***120 grams of sodium nitrite***, followed by ***90 grams of finely powdered magnesium powder***, followed by ***190 grams of asphaltum***, followed by ***60 grams of finely divided boron***, and then followed by ***400 grams of ADN***, and then blend the mixture on moderate speed for about 1 hour at room temperature. After blending for about 1 hour, place the mixture onto a shallow tray or pan, and allow it to partially air-dry until only a slightly damp mass remains. Thereafter, press this slightly damp mass into any desirable rocket motor, engine, tube, ect., under high pressure, and then allow the munition to cure for several days.
Burn rate: 0.2 inches per second at 1000 psi (estimated).
Water resistance: Very good
Stability: Can be stored for many years.

Flammability (1 to 10): N/A.
Ease of ignition (1 to 10): 9
Tendency to cake: None
Explosive ability: Stable.
Percentage: ***46.51% ADN, 22.09% asphaltum, 13.95% sodium nitrite, 10.46% magnesium powder, 6.97% boron, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as propellant).
Use: Can be used in rockets for commercial and/or military use.

07-08-004A: Star pyrotechnic composition:
Into a suitable mixing drum, filled with small diameter Teflon coated steel shot, place ***250 grams of finely divided ADN***, followed by ***190 grams of barium chlorate***. Thereafter, tumble the mixture on low speed for about 1 hour. Thereafter, into a suitable beaker or similar container, place 100 milliliters of 95% ethyl alcohol, and then add and dissolve ***80 grams of standard commercially available shellac***, and then stir the mixture to dissolve the bulk of the shellac. Thereafter, add in the ADN/barium chlorate mixture, and then blend the mixture (preferably with a motorized stirrer), for about 2 hours at room temperature. Thereafter, place the stirred mixture onto a shallow pan, and allow it to thoroughly air-dry. Note: a vacuum apparatus can be used to save solvent and speed up the process. Thereafter, place the dried mass into a clean ball mill, fitted with Teflon coated steel shot of the usual diameter, and then tumble the mixture for about 1 hour to form a uniform mixture. Thereafter, place the pulverized mass into a clean beaker or similar container, and then add in a very small amount of a 50/50 mixture of acetone and water, and then blend the mixture manually to form a paste. Thereafter, the paste can be kneaded or rolled into dough like balls (stars), of any desired diameter. Once the stars have been rolled, they should be cured in an oven at moderate temperature until dry and hard.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Moderate.
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48.07% ADN, 36.53% barium chlorate, 15.38% shellac, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making effects stars for use in rockets, mortars, and other aerial display fireworks.
Note: the ADN can be replaced with KDN if desired.

07-08-005A: Pyrotechnic star mixture for aerial fireworks:
Into a suitable mixing bowl or container, equipped with motorized stirrer, place 170 milliliters of acetone followed by ***150 grams of powdered or flaked PVC polymer***, and then blend the mixture for about 15 minutes at room temperature. Thereafter, add in ***200 grams of magnesium powder,*** and then followed by ***480 grams of ADN***, and then continue to blend the mixture for about 30 minutes at room temperature. Now, add in 150 milliliters of ice-cold water, and then continue to blend the mixture on moderate speed for about 30 minutes. Thereafter, filter-off the insoluble mass, and then press the filtered-off pasty mass into any desirable shape such as a pellet, discs, rods, ect., or dry the filtered-off mass to the point where it forms a pasty dough like mass. Then roll the pasty dough like mass into stars of any desired size. Thereafter, bake the stars in an oven at moderate temperature until they are dry and hard.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***57.83% ADN, 24.09% magnesium powder, 18.07% PVC, 0,01% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.
Note: the ADN can be replaced with KDN if desired.

07-08-006A: Star composition for aerial fireworks:
Into a suitable beaker or similar container, place 200 milliliters of tetrahydrofuran, and then add and dissolve ***150 grams of fine-grained PVC powder***. Thereafter, add in ***220 grams of average commercially available magnesium grains,*** and then blend the mixture for about 15 minutes. Thereafter, add in ***400 grams of ADN,*** and then followed by ***50 grams of copper-II-chloride***, and then continue to blend the mixture for about 1 hour. Thereafter, add in 200 milliliters of ice-cold water, and then stir the mixture for about 5 minutes. Thereafter, filter-off the insoluble mass, and then place it on a shallow pan and allow it to dry until a thick dough like

material is obtained. Once it is, roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: Typical for star compositions.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ½
Ease of ignition (1 to 10): 7
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48.78% ADN, 26.82% magnesium, 18.29% PVC powder, 6.09% copper-II-chloride, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.
Note: the ADN can be replaced with KDN if desired.

07-08-007A: Star composition for aerial fireworks:
Into a suitable beaker or similar container, place 75 milliliters of 95% ethyl alcohol, followed by 75 milliliters of ice-cold water. Then add in ***140 grams of red gum***, followed by ***20 grams soft wood charcoal,*** followed by ***120 grams of "Parlon" compound,*** and then followed by ***60 grams of powdered dextrin.*** Thereafter, simply blend the mixture for about 30 to 40 minutes to form a dough. Thereafter, add in 50 milliliters of acetone followed by ***320 grams of barium nitrate***, followed by ***480 grams of ADN,*** and finally followed by ***50 grams of flours of sulfur***. Then continue to blend the mixture for about 30 minutes. Now, filter-off any liquid, and then place the filtered-off mass onto a shallow pan or tray and allow it to dry to the point that a thick dough is obtained. Once a nice dough is obtained, simply roll the dough like material into stars of any desirable diameter. The stars should be cured in an oven at moderate temperature until dry and hard. These stars may need to be primed.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.33% ADN, 26.89% barium nitrate, 11.76% red gum, 10.08% parlon compound, 5.04% dextrin, 4.2% sulfur, 1.68% wood charcoal, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.
Note: the ADN can be replaced with KDN if desired.

07-08-008A: Star composition for aerial fireworks:
Into a suitable mixing bowl or similar container, equipped with motorized stirrer, add in 100 milliliters of acetone. Thereafter, add in ***60 grams of shellac***, followed by ***30 grams of dextrin,*** and then followed by ***170 grams of powdered sulfur***, and then blend the mixture for about 10 minutes. Thereafter, add in ***200 grams of copper-II-oxide,*** followed by ***600 grams of ADN***, and then blend the mixture for about 10 minutes. Thereafter, add in 100 milliliters of 99% isopropyl alcohol (chilled to 0 Celsius), and then continue to blend the mixture for about 5 minutes. Thereafter, pour-off any liquid, or filter-off the solid mass, and then allow the mass to dry to the point where a dough like material remains. Once it has, the mixture is ready for use. To use, simply roll the mixture into stars of any desirable diameter, and then cure the stars in an oven at moderate temperature. This star may or may not need to be primed.
Burn rate: N/A.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.
Explosive ability: Possible, but only under severe conditions.
Percentage: ***56.6% ADN, 18.86% copper-II-oxide, 16.03% sulfur, 5.66% shellac, 2.83% dextrin binder, 0.02% residue***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.
Note: Numerous modifications exist for this process.
Note: the ADN can be replaced with KDN if desired.

07-08-009A: Star composition with bushy flame:
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot, place ***90 grams of fine grained red phosphorus,*** followed by ***90 grams of copper-II-oxide***, followed by ***180 grams of finely divided PVC***. Thereafter, tumble the mixture at 300 RPM for about

1 hour. Thereafter, place the tumbled mixture into a clean mixing bowl or container, equipped with motorized stirrer, and then add in 75 milliliters of tetrahydrofuran. Then, add in ***600 grams of ADN***, and then blend the mixture for about 30 minutes. Now, add in 75 milliliters of ice water, and then continue to blend the mixture for about 10 minutes. Thereafter, filter-off the insoluble mass, and then place it on a tray and allow it to dry but only until a dough like material is obtained (manually blend periodically). Once a dough like material is obtained, simply roll the material into stars of any desired diameter, and then cure them in an oven at moderate temperature.

Burn rate: 0.05 inches per second at normal psi
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***62.5% ADN, 18.75% PVC, 9.375% copper-II-oxide, 9.375% red phosphorus***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.
Note: the ADN can be replaced with KDN if desired.

07-08-010A: Brilliant star composition for aerial use:
Into a suitable mixing bowl or similar container, place 175 milliliters of acetone, and then add in ***100 grams of finely powdered soft wood charcoal***, followed by ***240 grams of sulfur***, followed by ***20 grams of rosin***, and then blend the mixture for about 10 minutes. Now, add in ***600 grams of meal powder***, and then followed by ***550 grams of ADN***. Thereafter, blend the mixture until a dough like material is obtained. Once a dough like material is obtained, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter and then cure in an oven in the usual manner. The stars should be primed in the usual manner.

Burn rate: Below moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***39.73% meal powder, 36.42% ADN, 15.89% sulfur, 6.62% wood charcoal, 1.32% rosin, 0.02% balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making colored stars for a variety of aerial devices.
Note: the ADN can be replaced with KDN if desired.

07-08-011A: Brilliant star composition for aerial use (fortified with dextrin):
Into a suitable mixing drum or similar container, equipped with motorized stirrer, place 175 milliliters of 95% ethyl alcohol. Thereafter, add in ***100 grams of shellac***, followed by ***100 grams of finely powdered PVC,*** followed by ***100 grams of powdered cryolite mineral***, and then followed by ***700 grams of ADN***. Thereafter, blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, and then cure the stars in an oven at average temperature in the usual means. Prime the stars with any desired primer.

Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6 ¾
Ease of ignition (1 to 10): 7+
Tendency to cake: None.
Explosive ability: Stable—will explode if confined and ignited.
Percentage: ***70% ADN, 10% shellac, 10% cryolite synthetic mineral, 10% PVC***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making yellow stars for a variety of aerial devices.
Note: the ADN can be replaced with KDN if desired.

07-08-012A: Brilliant star composition for multiple purposes:
Into a suitable ball mill, filled with 250 grams of Teflon coated steel shot, place 175 milliliters of ether, followed by ***100 grams of flours of sulfur***, followed by ***140 grams of fine powdered charcoal***, and then followed by ***190 grams of magnesium oxalate***. Thereafter, tumble the mixture on low RPM for about 40 minutes. Now, into a suitable mixing bowl, equipped with motorized stirrer, place ***180 grams of dextrin***, followed by ***250 grams of flake aluminum***, followed by ***450 grams of fine "gray" aluminum powder***, and then followed by 250 milliliters of acetone, and then blend the mixture on moderate speed for about 20 minutes. Thereafter, place the mixture onto a shallow pan or tray, and allow it to thoroughly air-dry. Thereafter, place the dried mass into a clean separate ball mill, filled with 250 grams of heavy Teflon coated steel shot, and then tumble the mixture for about 30 minutes to form a uniform powder. Finally, place the tumbled mixture (containing the magnesium oxalate), into a clean mixing bowl, and then add in the second tumbled mixture containing the aluminum. Now, add in 500 milliliters of ice water, and then finally add in ***900 grams of finely powdered ADN***, and then blend the mixture for about 1 hour to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner, but this is not necessarily needed. This composition can also be used for making tail fires for rockets and the like. In essence, this mixture can be used in almost any pyrotechnic munition, such as cones, flares, buzz-bombs, ect.,

Burn rate: Above average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7 ¾
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***40.72% ADN, 20.36% gray aluminum powder, 11.31% flake aluminum, 8.59% magnesium oxalate, 8.14% dextrin, 6.33% charcoal, 4.52% sulfur, 0.03% mixed residual balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used for making stars for multiple uses.

07-08-013A: Star composition for multiple purposes (lampblack special):
Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot, place ***300 grams of finely powdered lampblack***, followed by ***50 grams of shellac***, followed by ***50 grams of dextrin***, and then followed by ***250 grams of fine grained charcoal***, and then tumble the mixture on moderate RPM for about 1 hour. Thereafter, into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place the tumbled mixture obtained previously, and then add in ***300 grams of ADN,*** and then followed by ***90 grams of barium peroxide.*** Now, add in 125 milliliters of water, and then blend the mixture for about 15 minutes. Thereafter, add in 125 milliliters of acetone, and then blend the mixture for about 15 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material as a second layer on some other rolled star, and then cure the stars in an oven at moderate temperature until the stars are hard and dry, or press the mixture into any desired shape. The material can be primed in the usual manner. This composition can also be used for making tail fires for rockets and the like, and may be used in cones if desired.

Burn rate: 0.06 inches per second in loose form.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 6+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***28.84% ADN, 28.84% lampblack, 24.03% charcoal, 8.65% barium peroxide, 4.8% dextrin, 4.8% shellac, 0.04% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in tail fires, and for aerial devices.
Note: the ADN can be replaced with KDN if desired.

07-08-014A: Star composition for multiple purposes:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***40 grams of fine aluminum powder***, followed by ***80 grams of medium coarse aluminum***, followed by ***40 grams of black powder***, followed by ***60 grams of antimony sulfide***, and then followed by ***80 grams of flours of sulfur***. Thereafter, add in 100 milliliters of acetone, and then blend the mixture for about 30 minutes on moderate speed. Thereafter, add in ***240 grams of ADN***, and then continue to blend the mixture on moderate speed for about 30 minutes to form a rough dough-like material. Thereafter, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over an existing star to form a second layer. Note: the stars should then be cured in an oven at moderate temperature in the usual manner. The composition can be sieved through any desired mesh screen, and used as is, or pressed into tablets, rods, or pellets of any desired size. Priming may or may not be needed.

Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ¾

Tendency to cake: None.
Explosive ability: None.
Percentage: ***44.44% ADN, 14.81% sulfur, 14.81% coarse aluminum, 11.11% antimony sulfide, 7.4% aluminum powder, 7.4% black powder, 0.03% residues***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets, but can also be used in cones, fountains, and the like.
Note: the ADN can be replaced with KDN if desired.

07-08-015A: Star composition for multiple purposes:
Into a suitable mixing bowl, or similar container, equipped with motorized stirrer, place ***90 grams of flours of sulfur***, followed by ***400 grams of powdered soft wood charcoal***, and then followed by ***190 grams of antimony trisulfide***. Thereafter, add in 200 milliliters of 95% ethyl alcohol, and then blend the mixture on moderate speed for about 15 minutes. Now, into a separate mixing bowl, equipped with motorized stirrer, place ***90 grams of spherical aluminum***, followed by ***940 grams of ADN***, and then followed by ***120 grams of dry glucose powder***. Thereafter, add in 300 milliliters of acetone, and the blend the mixture on moderate speed for about 15 minutes. Thereafter, once both mixtures have been blended, add both mixtures to a third, clean mixing bowl, equipped with another motorized stirrer, and then blend the combined mixture for about 40 minutes. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the material onto existing stars to form a second coating, and then cure the stars in an oven at moderate temperature until dry and hard. The mixture can also be used as a rocket propellant for small and moderate sized rockets (will produce a brilliant fire trail). The mixture can also be used in the form of a loose powder, or grains of any desired sieve size for any desired purpose (mainly for making brilliant fire trails).
Burn rate: Above Moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 7
Ease of ignition (1 to 10): 6 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***51.36% ADN, 21.85% soft wood charcoal, 10.38% antimony trisulfide, 6.55% glucose, 4.91% sulfur, 4.91% aluminum, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used in stars for mortars and rockets (for producing brilliant fire trails), but can also be used in cones, fountains, and for other purposes.

07-08-016A: Star composition for multiple purposes:
Into a suitable ball mill, filled with 300 grams of Teflon coated steel shot, of the usual diameter, place ***400 grams of ADN***, followed by ***240 grams of finely powdered soft wood charcoal***. Thereafter, add in 125 milliliters of water, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, place this tumbled mixture into a suitable mixing bowl, or any similar container, equipped with motorized stirrer, and then add in 150 milliliters of acetone. Thereafter, add in ***90 grams of sucrose***, and then followed by ***80 grams of finely powdered sodium sulfide anhydrous***, and then blend the entire mixture on high speed for about 30 minutes, or until a fine dough like material obtained. Note: more solvent may be added if the mixture is too dry. Once a dough-like material has been obtained, the mixture is ready for use. To use, simply roll the doughy-like material into stars of any desired diameter, or roll the material onto existing stars to form a second layer, and then cure in an oven in the usual manner. The material can also be used as a dry powder, or of any desired grain size, or the mixture can be pressed into molds, rods, or pellets of any desired shape for any desired use.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ¾
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***49.38% ADN, 29.62% soft wood charcoal, 11.11% sucrose, 9.87% sodium sulfide, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Can be used for multiple purposes.
Note: the ADN can be replaced with KDN if desired.

07-08-017A: Brilliant star composition with silver tail:
Into a suitable mixing drum, bowl, or similar container, equipped with motorized stirrer, place 300 milliliters of ethyl acetate, and then add in ***500 grams of ADN***, followed by ***500 grams of coarse aluminum***, and then followed by ***50 grams of glutinous rice starch***. Thereafter, blend the mixture on moderate speed for about 30 to 40 minutes to form a uniform dough. Thereafter, the mixture is ready for use. To use, simply roll the material into stars of any desired diameter, or roll the mixture onto existing stars to form a second layer of any desired thickness, and then cure the stars in an oven at moderate temperature in the usual manner. Priming may or may not be needed.

Burn rate: 0.065 inches per second at 1000 psi
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***47.61% ADN, 47.61% coarse aluminum, 4.76% rice starch, 0.02% balance***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create spectacular looking tail effects.
Note: the ADN can be replaced with KDN if desired.

07-08-018A: Beautiful fire dust star composition:
Into a suitable mixing bowl, equipped with motorized stirrer, place 700 milliliters of acetone, and then add in ***980 grams of ADN***, and then followed by ***800 grams of flours of sulfur***. Thereafter, blend the mixture on high speed for about 2 hours. Thereafter, place the mixture in a warm place, or use a vacuum to allow the bulk of the solvent to evaporate. Once the bulk of the acetone has been removed, place the mixture back into the previous mixing bowl, or a clean one, equipped with motorized stirrer in the usual manner, and then add in ***120 grams of fine grained boron***, and then followed by ***100 grams of copper-I-chloride anhydrous***. Thereafter, add in 275 milliliters of hexane, and then blend the mixture on moderate speed for about 30 minutes to form a dough. Note: more hexane may need to be added to form a good dough. Once a dough-like material has been achieved, the mixture is ready for use. To use, the mixture simply needs to be rolled into stars of any desired diameter, or rolled over existing stars to form a second coating. The stars should be cured in an oven at ordinary temperature until dry and hard. The mixture can also be used for multiple purposes.
Burn rate: Above moderate.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5 ½
Tendency to cake: None.
Explosive ability: Stable.
Percentage: ***49% ADN, 40% sulfur, 6% boron, 5% copper-I-chloride anhydrous***
Classification: Deflagrating explosive (classified as pyrotechnic composition).
Use: Used to create beautiful fire dust effects.
Note: the ADN can be replaced with KDN if desired.

07-08-019A: Brilliant strobe star:
Into a suitable empty ball mill, place 15 milliliters of linseed oil, and then add in ***360 grams of powdered magnalium 50/50 alloy***, and then tumble the mixture for about 15 minutes to coat it. Now, into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in ***90 grams of nitrocellulose***, and then stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in ***100 grams of hexachloroethane***, followed by ***600 grams of flours of sulfur***, followed by ***800 grams of ADN***, followed by 360 grams of the linseed coated magnalium, prepared in the beginning, and then followed by ***160 grams of phosphorus pentasulfide***, and then blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. Now, into a suitable ball mill, filled with 500 grams of Teflon coated steel shot of the usual diameter, place ***100 grams of potassium peroxide***, followed by ***350 grams of copper-II-oxide,*** followed by ***700 grams of magnesium powder***, and then followed by ***1000 grams of sodium chlorate***. Thereafter, add in 250 milliliters of acetone, and then tumble the entire mixture at 100 to 200 RPM for about 1 hour. Finally, place this tumbled mixture into the beaker used for the preparation of the first mixture (containing the nitrocellulose and gently boiling acetone), and then add in 500 milliliters of additional acetone, and then continue to blend the mixture for about 45 minutes. Note: more solvent may be added to compensate for evaporation. Thereafter the dough-like mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.
Burn rate: Average.
Water resistance: Good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A
Ease of ignition (1 to 10): N/A
Tendency to cake: None.

Explosive ability: Stable.

Percentage: *23.47% sodium chlorate, 18.77% ADN, 16.43% magnesium powder, 14.08% sulfur, 8.45% magnalium 50/50 alloy, 8.21% copper-II-oxide, 3.75% phosphorus pentasulfide, 2.34% hexachloroethane, 2.34% potassium peroxide, 2.11% nitrocellulose, 0.05% mixed residual balance*

Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Used to create beautiful twinkling strobe effects for multiple purposes.

07-08-020A: Brilliant strobe star:

Into a suitable beaker, place 600 milliliters of acetone, and then gently heat the mixture until it begins to boil gently. Thereafter, add in *60 grams of nitrocellulose*, and the stir the mixture until the bulk of the acetone evaporates. Note: more acetone may need to be added to compensate for evaporation. Thereafter, add in *660 grams of ADN*, followed by *100 grams of antimony pentasulfide*, followed by *140 grams of barium nitrate*, followed by *220 grams of hexachloroethane*, followed by *540 grams of sulfur*, and then followed by *100 grams of sodium oxalate*. Thereafter, blend the mixture, using a motorized stirrer, for about 45 minutes. Note: more acetone may be needed to compensate for lost solvent due to evaporation. In the meantime, place *240 grams of magnalium 50/50 alloy* into an empty ball mill, and then add in 15 milliliters of linseed oil, and then tumble the mixture for about 5 minutes. Thereafter, remove the coated magnalium alloy, and then add it to the previous mixture. Note: more acetone may be needed to compensate for loss by evaporation. Thereafter, continue to blend the entire mixture for about 15 to 20 minutes. Thereafter, the material should be a uniform dough, if not, add more solvent and continue blending to form a nice dough. Thereafter the mixture is ready for use. To use, the material simply needs to be rolled into stars of any desired diameter, or rolled over existing stars, black powder burster, or any other pre-rolled star or composition to form an outer layer in the usual manner. In either case, the end product should be cured in an oven at ordinary temperature in the usual manner. Prime with typical priming mixture.

Burn rate: Below average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5

Ease of ignition (1 to 10): 5 ½

Tendency to cake: None.

Explosive ability: Stable.

Percentage: *32.03% ADN, 26.21% sulfur, 11.65% magnalium alloy, 10.67% hexachloroethane, 6.79% barium nitrate, 4.85% sodium oxalate, 4.85% antimony pentasulfide, 2.91% nitrocellulose, 0.04% mixed balance*

Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Used to create beautiful twinkling strobe effects for multiple purposes.

Note: the ADN can be replaced with KDN if desired.

07-08-021A: Smoke strobe star:

Into a suitable ball mill, filled with 100 grams of heavy Teflon coated steel shot, place *60 grams of realgar mineral*, and then tumble it at 300 RPM for about 30 minutes. Thereafter, place this tumbled realgar into a suitable mixing bowl, equipped with motorized stirrer, followed by 450 milliliters of 95% ethyl alcohol, and then add in *120 grams of glutinous rice starch*, followed by *40 grams of powdered soft wood charcoal*, followed by *970 grams of powdered red phosphorus*, and then followed by *970 grams of ADN*. Thereafter, blend the mixture on moderate speed for about 15 to 20 minutes to form a uniform mixture. Thereafter, the mixture is ready for use. To use, simply roll the mixture into stars of any desired diameter, or roll onto existing stars to form a second coating, and then cure the stars in an oven at ordinary temperature. Prime with black powder, or perchlorate in the usual manner.

Burn rate: Average.

Water resistance: Good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5+

Ease of ignition (1 to 10): 5 ¾

Tendency to cake: None.

Explosive ability: Stable.

Percentage: *44.9% ADN, 44.9% red phosphorus, 5.55% rice starch, 2.77% realgar, 1.85% soft wood charcoal, 0.03%% mixed balance*

Classification: Deflagrating explosive (classified as pyrotechnic composition).

Use: Used to create colored smoke effects for multiple purposes.

Note: the ADN can be replaced with KDN if desired.

07-08-022A: Smoke composition for use in fireworks:

Into a suitable ball mill, filled with 200 grams of Teflon coated steel shot of the usual diameter and weight, place *300 grams of potassium chlorate*, followed by *1300 grams of any combustible dye agent*, followed by *400 grams of flours of lactose*, followed by *300 grams of copper sulfide*, and then followed by *600 grams of ADN*, and then tumble the mixture on moderate speed for about 20 minutes to form a uniform mixture. Thereafter, the mixture is ready to be pressed. To do so, simply place the mixture into any

desirable mixing container equipped with motorized stirrer, and then add in 75 milliliters of hexane, and then blend the mixture for about 10 minutes to form a mild paste. Thereafter, simply press the pasty mass into any desirable container, mold, cone, tube, ect under a pressure of about 6000 psi in the usual manner, and then allow the firework munitions to cure. Should be ignited using any standard ignition composition.

Burn rate: Moderate.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5

Ease of ignition (1 to 10): 5

Tendency to cake: None.

Explosive ability: None.

Percentage: *44.82% dye agent, 20.68% ADN, 13.79% lactose, 10.34% copper sulfide, 10.34% potassium chlorate, 0.03% residual balance*

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used to generate smoke for various applications.

Note: the ADN can be replaced with KDN if desired.

07-08-023A: Smoke composition:

Into a suitable ball mill, filled with 200 grams of heavy Teflon coated steel shot, place *600 grams of finely powder PVC*, and then followed by *500 grams of hexachlorobenzene*. Thereafter, add in 75 milliliters of acetone, and then tumble the mixture at 500 RPM for about 1 hour. Thereafter, place this mixture into a suitable mixing bowl, blender, container, ect., equipped with motorized stirrer in the usual manner, and then place 300 milliliters of hexane, followed by *1200 grams of ADN,* and then followed by *250 grams of Teflon*. Thereafter, blend the mixture for about 30 minutes to form a stiff paste. Thereafter, the mixture is ready for use. To use, simply press the mixture into any desirable smoke grenade ball, grenade, container, mold, ect., and then cure the munitions in an oven at 50 to 60 Celsius until thoroughly dry. Requires proper ignition composition for proper burn (magnesium based composition).

Burn rate: Slow.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): 5 ½

Ease of ignition (1 to 10): 5

Tendency to cake: None.

Explosive ability: None.

Percentage: *47.05% ADN, 23.52% PVC, 19.6% hexachlorobenzene, 9.8% Teflon, 0.03% mixed balance*

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Can be used to generate smoke for various purposes.

Note: the ADN can be replaced with KDN if desired.

07-08-024A: ADN/Urea-formaldehyde composition for fountains/cones:

Into a suitable mixing bowl, blender, or suitable container, equipped with motorized stirrer utilizing a plastic stir blade, place *90 grams of finely divided aluminum*, followed by *30 grams of magnesium oxalate*, followed by *300 grams of ADN,* and then gently dry blend the mixture for about 10 minutes. Thereafter, add in *130 grams of a urea-formaldehyde resin* (commercially available), and then continue to gently blend the mixture for about 15 minutes. Thereafter, press the mixture into any desirable cone, fountain, ect, utilizing the normal techniques and then cure the cones, fountains, ect., in an oven at 80 Celsius for about 3 to 4 minutes. Can be ignited using any standard means.

Burn rate: Average.

Water resistance: Very good.

Stability: Can be stored for many years.

Flammability (1 to 10): N/A

Ease of ignition (1 to 10): N/A

Tendency to cake: None.

Explosive ability: None.

Percentage: *54.54% ADN, 23.63% urea-formaldehyde resin, 16.36% aluminum, 5.45% magnesium oxalate, 0.02% mixed balance*

Classification: Deflagrating explosive (classified as consumer fireworks composition).

Use: Used for making fountains and cones.

07-08-025A: Standard fountain composition:

Into a suitable container, place *300 grams of ADN*, followed by *25 grams of coarse meal powder*. Thereafter, gently blend the mixture using a plastic spatula or equivalent for about 10 minutes. Thereafter, add in 50 milliliters of acetone, followed by *25 grams of potassium nitrate*, and then followed by *225 grams of aluminum powder* of average commercial availability. Thereafter blend the

mixture until some of the acetone evaporates. Thereafter, the moist mixture is ready for use. To use, it simply needs to be pressed into any desirable cone or fountain device in the usual manner, and then allowed to thoroughly dry.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½ (steady burn)
Ease of ignition (1 to 10): 7 ½
Tendency to cake: None.
Explosive ability: None.
Percentage: ***52.17% ADN, 39.13% aluminum powder, 4.34% meal powder, 4.34% potassium nitrate, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in cones and fountains.
Note: the ADN can be replaced with KDN if desired.

07-08-026A: Bengal light composition:

Into a suitable ball mill, filled with Teflon coated steel shot of the usual weight and diameter, place ***200 grams of barium peroxide***, followed by ***550 grams of ADN***, followed by ***50 grams of aluminum oxide***, followed by ***90 grams of aluminum powder***, and then followed by ***250 grams of flours of charcoal***, and then tumble the mixture for about 1 hour at 250 RPM. Thereafter, into a suitable beaker or similar container, equipped with motorized stirrer, place the tumbled mixture there into, followed by 150 milliliters of acetone, and then knead or blend the mixture for about 15 to 20 minutes. Thereafter, the mixture is ready to be pressed. To do so, simply press the mixture into any desirable cone, fountain, mold, or coat any desirable material, and then allow the device(s) to thoroughly air-dry in the usual manner.
Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Average.
Ease of ignition (1 to 10): Average.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***48.24% ADN, 21.92% charcoal, 17.54% barium peroxide, 7.89% aluminum powder, 4.38% aluminum oxide, 0.03% mixed impurities***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Can be used in Bengal lights, sparklers and for making colored fires for multiple uses.
Note: the ADN can be replaced with KDN if desired.

07-08-027A: Sparkler composition:

Into a suitable mixing drum, or bowl, equipped with a motorized stirrer in the usual means, place ***150 grams of shellac***, followed by ***1200 grams of fine grained aluminum***, followed by ***90 grams of coarse iron grains***, and then followed by ***800 grams of ADN***. Thereafter, add in about 275 milliliters of 95% ethyl alcohol, and then blend the mixture for about 30 minutes to form a good paste. Thereafter, the paste is ready for use. To use, the paste simply needs to be evenly coated onto any length of steel rod. The rods can be anywhere from 3 to 5 milliliters in diameter. Thereafter, the sparklers should be allowed to dry in an oven at low temperature. The paste can also be pressed into any cone, fountain, tube, ect., in the usual manner. The mixture in either case, should be ignited using any standard ignition composition.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***53.57% aluminum grains, 35.71% ADN, 6.69% shellac, 4.01% coarse iron, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in sparkler compositions. Can also be used in other fireworks for generating a beautiful shower of sparks.
Note: the ADN can be replaced with KDN if desired.

07-08-028A: Fountain composition for use in fountains and other purposes:

Into a suitable empty ball mill, place ***90 grams of potassium oxide***, followed by ***90 grams of aluminum powder***, followed by ***90 grams of soft wood charcoal***, followed by ***50 grams of sulfur***, followed by ***150 grams of ADN***, and then followed by ***100 grams of meal powder***. Thereafter, tumble the mixture at 500 RPM for about 2 hours. Thereafter, place this tumbled mixture into a suitable mixing bowl, and then add in 75 milliliters of 99% isopropyl alcohol, and then blend the mixture on moderate speed for about 30 minutes. Thereafter, the mixture is ready for use. To use, simply press the mixture under high pressure into any desirable container, tube, cone, fountain, ect., in the usual manner, and then cure at room temperature or in an oven at moderate temperature in the usual manner. Prime with the usual primer.

Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): Typical.
Ease of ignition (1 to 10): Typical.
Tendency to cake: None.
Explosive ability: None.
Percentage: ***26.31% ADN, 17.54% meal powder, 15.78% potassium oxide, 15.78% aluminum powder, 15.78% soft wood charcoal, 8.77% sulfur, 0.04% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fountain compositions for the usual purposes.
Note: the ADN can be replaced with KDN if desired.

07-08-029A: Fire composition with multiple uses:

Into a suitable ball mill, filled with 500 grams of Teflon coated steel shot, in the usual diameter, place ***800 grams of ADN***, followed by ***90 grams of coarse iron grains***, followed by ***250 grams of meal powder***, followed by ***90 grams of ammonium perchlorate***, and then followed by ***200 grams of "orange" shellac product***. Thereafter, add in 150 milliliters of acetone, and then tumble the mixture at 150 RPM for about 1 hour. Thereafter, place the mixture into a suitable mixing bowl, equipped with motorized stirrer, and then add in 300 milliliters of acetone, and then blend the mixture on high for about 30 minutes. Thereafter, the mixture is ready for use. To use, the mixture needs to be pressed into any desirable form, tube, container, ect., under high pressure, or it can be formed into any desired shape, or rolled into stars, or rolled over any existing, pre-formed mixture for combination effects or any other desired means, and then the material needs to be cured in an oven in the usual means. Priming may or may not be needed.
Burn rate: Moderate.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 6+
Ease of ignition (1 to 10): 5 ¾
Tendency to cake: None.
Explosive ability: None.
Percentage: ***55.94% ADN, 17.48% meal powder, 13.98% orange shellac product, 6.29% ammonium perchlorate, 6.29% coarse iron grains, 0.02% mixed residual balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-08-030A: Sparkler composition for different uses:

Into a suitable mixing bowl, drum, ect., equipped with motorized stirrer in the usual manner, and then add in 400 milliliters of 95% ethyl alcohol, or any suitable solvent. Thereafter, add in ***700 grams of ADN***, followed by ***100 grams of aluminum flake***, followed by ***150 grams of flours of sulfur***, and then followed by ***150 grams of fine grain soft wood charcoal***. Thereafter, blend the mixture on moderate speed for about 40 minutes to form a uniform paste. Note: more or less solvent may be needed to form a uniform paste. Thereafter, the mixture is ready for use. To use, the sparkler composition should be coated onto steel rods of any desired thickness. The composition can also be pressed into tablets, or coated onto anything for any desired purpose. The mixture in either case, should be cured in an oven at moderate temperature. Prime in the usual manner.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5+
Ease of ignition (1 to 10): 5+
Tendency to cake: None.
Explosive ability: None.
Percentage: ***63.63% ADN, 13.63% sulfur, 13.63% charcoal, 9.09% aluminum flake, 0.02% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-08-031A: Sparkler composition:

Into a suitable mixing bowl, equipped with motorized stirrer, place 300 milliliters of acetone, and then followed by ***150 grams of dextrin***, followed by ***500 grams of ADN***, and then followed by ***350 grams of powdered aluminum***, and the blend the mixture on moderate speed for about 50 minutes. Thereafter, the mixture is ready for use. To use, simply coat any metal rod with any desired

thickness, and then cure the sparklers in an oven at moderate temperature. If desired the mixture can be pressed into pellets or tablets for use in any desired manner. Prime using the usual mixtures.
Burn rate: Average.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): 5 ½
Ease of ignition (1 to 10): 6
Tendency to cake: None.
Explosive ability: None.
Percentage: ***50% ADN, 35% aluminum powder, 15% dextrin***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used in fireworks for the usual purposes.

07-08-032A: Pyrotechnic composition for use in cones and other devices:
Into a suitable beaker or similar container, equipped with motorized stirrer, place 75 milliliters of warm water, and then add and dissolve ***25 grams of chromium trioxide***, and then add in ***250 grams of ADN***, followed by ***50 grams of red iron-III-oxide***, and then blend the mixture on moderate speed for about 30 minutes to form a paste. Thereafter, add in ***175 grams of antimony trisulfide***, followed by ***75 grams of magnesium peroxide***, and then continue to blend the mixture for about 10 to 15 minutes. After which, add in ***100 grams of phosphorus sesquisulfide***, and then continue to blend the mixture for about 30 minutes. After 30 minutes, the mixture is ready for pressing and forming. To do so, simply press the pasty mass into any desirable shape, into any desirable tube, cone, ect., and then cure the munition in an oven at 70 Celsius until dry and hard.
Burn rate: N/A.
Water resistance: Very good.
Stability: Can be stored for many years.
Flammability (1 to 10): N/A.
Ease of ignition (1 to 10): N/A.
Tendency to cake: None.
Explosive ability: Unknown.
Percentage: ***37.03% ADN, 25.92% antimony trisulfide, 14.81% phosphorus sesquisulfide, 11.11% magnesium peroxide, 7.4% iron-III-oxide, 3.7% chromium trioxide, 0.03% mixed balance***
Classification: Deflagrating explosive (classified as consumer fireworks composition).
Use: Used for making various pyrotechnic mixtures.

References

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, ADN, and KDN pages 151 to 153

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, Nitrocellulose pages 212 to 220

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, Ammonium picramate, pages 308 to 309

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, AP, pages 310 to 311

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, Sodium picramate, pages 313 to 314

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, AN, pages 315 to 319

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, AC, pages 319 to 320

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, APC, pages 320 to 322

Jared Ledgard, The Preparatory Manual of explosives, 2nd Edition, Nitroguanidine, pages 361 to 362

Jared Ledgard, Kings Chemical Survival Guide, pdf version 1.2, Oct. 2003, "electro preparation 3: sodium chlorate, pages 67 to 73

"Black powder composition", Serial number: 438,186, March 4th, 1930 to Benjamin Austin Gillie, Woodbury, NJ; assigned by E.I. Du Pont de Nemours & Company.

"Slow burning black powder composition", Serial number: 288,135, April 7th, 1919, to Joseph Percy Gray, of Newport, Delaware; assigned by E.I. Du Pont De Nemours & Company.

"Thermoplastic composite rocket propellant", application No. 272,859, June 12, 1981, to: Henry C. Allen, Decatur, AL. assigned by: The United States Army

Application No. 903,000, September 2, 1986, by Morton Thiokol, Inc., to Rodney L. Willer, New London, PA, James A. Hartwell, Elkton, MD, and Robert G. Gleeson, Newark, DE

"Granular propellant", Application No. 964,040, November 27, 1978, by Nippon Oil and Fats Co., Ltd. , to Kazuhiro Inoue, Aichi, JP, and Fumio Matsui, Handa, JP

"Propellant formulations based on dinitramide salts and energetic binders", Application No. 052035, April 21, 1993, by Hinshaw; Carol J. (Ogden, UT); Wardle; Robert B. (Logan, UT); Highsmith; Tom K. (North Ogden, UT), assigned by Thiokol Corporation (Ogden, UT)

"Infrared tracer for ammunition", Application No. 926376, September 9, 1997, by Henry, III; Guy H. (Marion, IL); Owens; Michael A. (Johnson City, IL); Terry; Jarrett L. (Carbondale, IL); Tucker; Mark A. (Buncombe, IL); Bone; Frank M. (Carterville, IL), assigned to Primex Technologies, Inc. (Marion, IL)

"Solid propellant composition", Application No. 161364, July 6, 1971, by Conyers; John A. (Fort Worth, TX); Oberth; Adolph E. (Fair Oaks, CA); Santerre; George M. (Sacramento, CA), assigned to: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Polyurethane propellant", Application No. 212,762, July 24th, 1962, to Peter L. Nichols, Sacramento, CA, assigned to: The United States Army.

"Composite polyurethane propellants with negative pressure exponent of ammonium sulfate", Serial number: 25,606, March 14th, 1970, to Gilbert A. Zimmerman, Sacramento, Ca, and Marshall L. Sherman, Fair Oaks, Ca, assigned to: Aerojet-General Corporation

"Pyrotechnic cloud seeding composition", Application number: 805854, June 13, 1977, to Slusher; Thomas W. (Louisville, CO), assigned by: Nuclei Engineering, Inc. (Louisville, CO)

"Match-head compositions", Application No. 693898, June 8, 1976, to Lanham; Albert Frank (Maidstone, EN); Barned; Philip Sydney (Welling, EN); Potter; Sydney Ralph (London, EN), assigned to: Bryant and May (London, EN)

"Process for preparing a match head composition containing particulate nitrocellulose and no sulfur", Application No. 654346, February 2, 1976, to Nagatugi; Shuzo (Kobe, JA); Miyagawa; Akira (Himeji, JA); Fukuoka; Suguru (Himeji, JA), assigned by: Daicel Ltd. (Osaka, JA)

"Low light level tracer mix", Serial No. 18.320, March 10th, 1970, to Thomas A. Doris, Jr., Palmyra, NJ, Assigned by the United States Army

"Chemical composition for combustible tip used for friction matches and method for manufacturing same", Application No. 280,596, August 14th, 1972, to Hiroshi Hijikata, Shizuoka, Japan, assigned to: Shizuoka match Co.

"Smoke generating compositions and methods of making the same", application No. 912021, July 24, 2001, to Tadros; Raef M. (White Hall, AR), assigned by: The United States of America as represented by the Secretary of the Army (Washington, DC)

"Castable smoke generating pyrotechnic composition and process for its preparation", application No. 512524, July 11, 1983, to: Sedat; Georges (Saint-Raphael, FR), assigned: Etat Francais represente par le Delegue General pour l'Armement (Paris, FR)

"Smoke composition", application No. 175710, August 6, 1980, to: Krone; Uwe (Hamfelde, DE); Moeller; Klaus (Trittau, DE), assigned by: Nico-Pyrotechnik Hanns-Juergen Diederichs KG. (Trittau, DE)

"Castable infrared illuminant compositions", application No. 478511, January 6, 2000, to: Nielson; Daniel B. (Brigham City, UT), assigned: Cordant Technologies Inc. (Salt Lake City, UT)

"Infrared illuminating composition", application No. 150427, November 9, 1993, to: Dillehay; David R. (Marshall, TX); Turner; David W. (Marshall, TX), assigned: Thiokol Corporation (Ogden, UT)

"Flare composition and flare comprising said composition", application No. 113015, October 23, 1987, to: Singer; Stewart M. (1800 Elsinore Rd., Riverside, CA 92506); Fitzgerald; Stanley (7721 San Diego Ave., Rancho Cucamonga, CA 91730)

"Pyrotechnic composition for cutting torch", application No. 440482, November 9, 1982, to: Kennedy; Katherine L. (White Plains, MD); Proctor; Paul W. (White Plains, MD); Dow; Robert L. (LaPlata, MD), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Simultaneous red smoke and bright flame composition containing ammonium iodate", application: 405648, August 5, 1982, to: Webster, III; Henry A. (Ellettsville, IN), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Green flare compositions", application no. 934659, August 17, 1978, to: Webster, III; Henry A. (Ellettsville, IN), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Simultaneous yellow smoke and yellow flame composition containing bismuth subnitrate", application No. 935423, August 21, 1978, to: Tanner, Jr.; John E. (Bloomington, IN); Webster, III; Henry A. (Ellettsville, IN), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Tracer composition and method of producing same", application No. 533412, June 5, 1990, to: Briere; Paul (Neufchatel, CA), assigned by: Minister of National Defence of Her Majesty's Canadian Government (Ontario, CA)

"Tracer and composition", application No. 829995, September 1, 1977, to: Ramnarace; Jawaharlal (Dana Point, CA), assigned by: Ford Aerospace & Communications Corporation (Dearborn, MI)

"Blue-burning tracer mix", application No. 577508, May 14, 1975, to: Mancinelli; Dennis J. (Philadelphia, PA); Puchalski; Walter J. (Southampton, PA), assigned to: The United States of America as represented by the Secretary of the Army (Washington, DC)

"Improvement in the manufacture of gunpowder", Letters patent No. 79,229, June 23rd, 1868, to: William H. Jackson

"Improvement application of grahamite in the manufacture of gun powder and lamp black", Letters patent No. 87,382, March 2nd, 1868, February 13th, 1869, to: P.H. Vander, New York, NY, "Improved gun powder", Letters patent No. 97,567, December 7th, 1869, to: Thomas Taylor, of Washington D.C.

"Black powder composition", serial No. 671,700, May 18th, 1933, to: Clarence W. Brooks, Jr., Woodbury, NJ, assigned by: E.I. Dupont de Nemours & Company

"Black powder", serial No. 120,120, January 11th, 1937, to: William H. Rinkenbach, and Vernon C. Allison, both of Dover, NJ, assigned by: The United States by the secretary of war

"Process for preparing black powder pellets", application No. 499,248, August 21st, 1974, to: H. William Voigt, Jr., Stanhope, NJ, Lawrence W. Pell, West Orange, NJ, Jean P. Picard, Morristown, NJ, assigned by: The United States Army

"Pyrotechnic composition", serial No. 772,067, October 28th, 1968, to: Duane M. Johnson, and Donald R. Razelton, both of Winslow IN, assigned by: the United States Navy

"Delay powder", serial No. 586,063, January 11th, 1932, George C. Hale, US Army, Dover, NJ

"Signal flare composition", serial No. 244,479, August 30th, 1951, to: John Vinton, San Francisco, CA

"Flare composition comprising dry blend of metal fuel and eutectic mixture of oxidizer salts", serial No. 866,069, October 1st, 1969, to: Howard W. Kruse, Ridgecrest, CA, assigned to: The United States Navy

"Flare composition", serial No. 78,642, October 6th, 1970, to: George A. Lane, Midland, MI, and William Arthur Smith, Westland, MI, assigned by: Dow Chemical Company

"Thermite compositions for use as gas generants", application No. 103768, August 10, 1993, to: Hinshaw; Jerald C. (Ogden, UT); Blau; Reed J. (Richmond, UT), assigned by: Thiokol Corporation (Ogden, UT)

"Igniter composition comprising a perchlorate, and potassium hexacyanocobaltate (III)", application No. 308,965, November 24th, 1972, to: John W. Fronabarger, of Phoenix, AZ, assigned by: UniDynamics/Phoenix, AZ

"First fire and igniter composition", serial No. 717,275, February 24th, 1958, to: David Hart, Dover, NJ, assigned to: The United Sates Army

"Non Gaseous pyrotechnic delay mixture", serial No. 177,544, August 3rd, 1950, to: Raymond H. Comyn, Silver Spring, Maryland

"Dark burning igniter composition", serial No. 130,584, December 1st, 1949, to: Raymond H. Heiskell, Compton, CA

"Igniting composition and method of preparing same", serial No. 228,962, May 29th, 1951, to: Sidney J. Magram, of Baltimore, Maryland, and John J. Blissel, of Kingsville, Maryland

"Advanced solid propellant for anti-tank propulsion subsystems", serial No. 238,704, March 23, 1972, to: David C. Sayles, of Huntsville, Alabama, assigned by: The United States Army.

"Rocket fuel", application No. 900,911, August 26th, 1986, to: Gerald P. Young, Newark, Delaware, assigned by: The United States Army

"Propellant explosive", serial No. 403,132, October 28th, 1929, to: William M. Dehn, Seattle, Wa

"Gun powder and process of making the same", serial No. 760,730, April 12th, 1913, to: Cantella-Dell McDowell, Pontiac, MI

"Pyrotechnic disseminating formulation", application No. 596,008, November 21st, 1966, to: Earl Thomas Niles, Midland, MI, assigned by: The Dow Chemical Company

"White smoke composition containing red phosphorus", application No. 876,118, November 12th, 1969, to: Bernard E. Douda, Bloomfield, IN, assigned by: The United States Navy

"Colored smoke producing smoke composition", application No. 903,630, August 29th, 1986, to: Gene V. Tracey, of Bel Air, Delaware, Joseph A. Domanica, Edgewood, Delaware, and Gerald P. Young, of Newark, NJ, assigned by: The United States Army

"Propellant compositions", application No. 715,221, March, 22nd, 1985, to: Everett E. Gilbert, Morristown, NJ, assigned by: The United States Army

"Pyrotechnic compound", letters patent No. 590,231, September 21st, 1897, to: Ernst Leusmann, Hanover, Germany

"Deflagrating propellant compositions", application No. 598,850, July 24th, 1975, to: Daniel E. Pawlak, Issaquah, Wa, and Michael Levenson, Cleveland heights, OH

"Pyrotechnic formulation with free oxygen consumption", application No. 395,480, September 10th, 1973, to: Brian K. Hamilton, and Eugene F. Garner, of Saugus, CA, assigned by: Allied Chemical Corporation

"Pyrotechnic composition", application No. 847,389, August 4th, 1969, to: Francis R. Taylor, of Mt. Arlington, NJ, Patricia J. Leader, of Rockaway, NJ, and Ramond P. Westerdahl, of Denville, NJ, assigned by: The United State Army

"Deflagrating composition", serial No. 18,220, March 23rd, 1960, to: Frank Abraham Loving, Jr., Wenonah, NJ, assigned by: E.I. Du pont De Nemours and company.

"Non explosive pyrotechnic composition", serial No. 73,768, April 10th, 1936, to: George C. Hale, Dover, NJ

"Pyrotechnic composition", serial No. 756,260, December 6th, 1934, to: George J. Schladt, Dover, NJ

"Signal smoke compositions", serial No. 749,360, May 20th, 1947, to: John Vinton, of San Francisco, CA, and Douglas M. MacMillan, of Berkeley, CA

"Colored Smoke composition", serial No. 494,694, July 14th, 1943, to: John W. Orelup, Short Hills, NJ

"Chlorate powder", serial No. 277,795, September 9th, 1905, to: Charles E. Mathews, of Rio, Wisconsin

"Combustible", serial No. 55,120, September 8th, 1925, to: Sterner St. P. Meek, of the United States Army

"Combustible", serial No. 82,120, January 18th, 1926, to: Sterner St. P. Meek, of the United States Army

"Flash powder", Letters Patent No. 659,331, October 9th, 1900, to: August Weiss, of Strasburg, Germany

"Improved fuse composition", Letters Patent No. 103,931, June 7th, 1870, to: William H. Rogers, of Brooklyn, NY

"Ignition mixture", serial No. 250,949, October 11th, 1951, to: Thomas J. Mulqueeny, of Dodfrey, ILL, assigned by: Olin Mathieson Chemical Corporation

"Igniter compositions", serial No. 329,111, December 31st, 1952, to: Franklin B. Clay, of Westport, Connecticut, Richard A. Sahlin, of Fairfield, Connecticut, assigned by: Remington Arms Company

"Lower burning rate, reduced hazard, high temperature incendiary", application No. 697252, October 27, 2000, to: Gill; Robert C. (White Plains, MD); Gotzmer; Carl (Accokeek, MD); Carpenter; Pamela (Indian Head, MD); Schlegel; Eric (Indian Head, MD), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Low slag, reduced hazard, high temperature incendiary", application No. 697245, October 27, 2000, To: Gill; Robert C. (White Plains, MD); Gotzmer; Carl (Accokeek, MD); Carpenter; Pamela (Indian Head, MD); Schlegel; Eric (Indian Head, MD), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Thermite destructive device", application No. 606514, to: Song; Eugene (Ellicott City, MD), assigned by: The United States of America as represented by the Secretary of the Army (Washington, DC)

"Low temperature gas generator propellant", application No. 500,810, August 26th, 1974, to: Eugene F. Garner, of Saugus, Ca, assigned by: Allied Chemical Corporation

"Solid propellant formulation based on hydroxylamine perchlorates", serial No. 242,941, December 10th, 1962, to: James P. Flynn, and Ernst J. Strayer, both of Midland, MI, assigned by: The Dow Chemical Company.

"Guanidine and lithium perchlorate salts and eutectics", serial No. 207,471, July 2nd, 1962, to: Joseph J. Bryne, of Boston, Mass, assigned to: Monsanto Research Corporation

"Starting mixture", serial No. 510,789, November 18th, 1943, to: Sidney J. Magram, of Baltimore, Maryland

"Pyrotechnic starter composition", serial No. 612, 149, May 18th, 1932, to: George U. Graff, of Washington DC

"Igniting mixture for tracer compositions", serial No. 670,096, October 22nd, 1923, to: Louis Hendler, of Philadelphia, PA, assigned by: The secretary of war of the United States.

"Near infrared illuminating composition", serial No. 255,333, May 22nd, 1972, to: Carl W. Lohkamp, Bloomfield, IN, assigned to: The United States Navy

"Pyrotechnic compound", serial No. 524,513, October 25th, 1909, to: Bernard J. Dever, and Bertram J. Delzeit, Philadelphia, PA

"Match head formulation", application No. 28,260, March 9th, 1993, to: Michael G. C. Cox, Kingsley England, assigned by: Bryant A May Ltd

"Colored Fire", serial No. 294,489, December 24th, 1888, to: John G. Stuttz, of San Diego, CA

"Pyrotechnic composition", serial No. 758,173, August 27th, 1958, to: Donald E. Olander, Florissant, MO, assigned by: Universal Match Corporation

Smokeless ashless signal flare composition containing ammonium perchlorate", serial No. 385,518, July 27th, 1964, to: James B. Mcgriffin, of Linton, IN, and William L. Ripley, of Bedford, IN, assigned by: The United States Navy

"Metal-cutting pyrotechnic composition", application No. 189410, September 22, 1980, to: Mueller; Kurt F. (Oxon Hill, MD); Chang; Marguerite S. (Oxon Hill, MD); Farncomb; Robert F. (Accokeek, MD); Malotky; Lyle O. (Oxon Hill, MD), assigned by: The United Stated of America as represented by the Secretary of the Navy (Washington, DC)

"Floatable incendiary composition", application No. 590370, June 25, 1975, to: Schroeder; Fred (Lakeview Terrace, CA), assigned by: Dow Corning Corporation (Midland, MI)

"Incendiary compositions of magnesium and fluoroalkyl phosphate esters", application No. 577199, May 14, 1975, to: Shaw; Graham C. (Garland, UT); Reed, Jr.; Russell (Ridgecrest, CA), assigned by: Thiokol Corporation (Newtown, PA)

"Pyrotechnic thermite composition", application No. 062500, February 5, 2002, to: Carter, Jr.; Greg (P.O. Box 3355, Joplin, MO 64803); Carter, Sr.; Greg (P.O. Box 3355, Joplin, MO 64803)

"Gas generant composition with coolant", application No. 798640, March 2, 2001, to: Knowlton; Gregory D. (Chandler, AZ); Ludwig; Christopher P. (Fountain Hills, AZ), assigned by: Talley Defense Systems, Inc. (Mesa, AZ)

"Thermally stable nonazide automotive airbag propellants", application No. 851503, May 5, 1997, to: Khandhadia; Paresh S. (Troy, MI); Burns; Sean P. (Ann Arbor, MI), assigned by: Automotive Systems Laboratory, Inc. (Farmington Hills, MI)

"Gas generating compositions", application No. 114196, July 13, 1998, to: Knowlton; Gregory D. (Chandler, AZ); Ludwig; Christopher P. (Fountain Hills, AZ), assigned by: Talley Defense Systems, Inc. (Mesa, AZ)

"High velocity gun propellant", application No. 262452, June 20, 1994, to: Williams; Laurence O. (Colchester, VT), assigned by: Martin Marietta Corporation (Bethesda, MA)

"Pyrotechnic composition for producing radiation-blocking screen", application No. 639685, April 4, 1984, to: Simpson; Geoffrey M. (Nottingham, GB), assigned by: Haley & Weller Limited (Draycott, GB)

"Smoke-producing pyrotechnic composition and its application", application No. 169204, July 15, 1980, to: Sedat; Georges A. (16h rue Jonyh-Prirrugue, 83700 St. Raphael, FR)

"Pyrotechnic disseminating formulations", application No. 853609, August 21, 1969, to: Flynn; James P. (Midland, MI), assigned by: The Dow Chemical Company (Midland, MI)

"Smoke-generating composition", application No. 817896, July 21, 1977, to: Johnson; Duane M. (Loogootee, IN); Webster, III; Henry A. (Ellettsville, IN), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Pyrotechnical mixture for producing a smoke screen", application No. 350737, April 26, 1989, PCT NO:, PCT/EP88/00378, April 26, 1989, to: Krone; Uwe (Hamfelde, DE), assigned by: Rheinmetall GmbH (Dusseldorf, DE)

"Pyrotechnical composition which generates smoke that is opaque to infrared radiance and smoke ammunition as obtained", application No. 517939, July 27, 1983, to: Espagnacq; Andre (Bourges, FR); Sauvestre; Gerard D. (Bourges, FR), assigned by: Etat Francais (Paris, FR)

"Smoke projectile charge and process for its manufacture", application No. 752637, December 8, 1976, to: Huber; Paul (Haus Nr. 9, 8234 Unterjettenberg, DE); Schiessl; Alois (Hochfeldstrasse 26, 8231 Weissbach-Marzoll, DE); Krone; Hartmut (Bertholdstrasse 4, 7844 Neuenburg, DE)

"Pyrotechnic smoke charge containing guanidine", application No. 036423, May 7, 1979, to: Prahauser; Georg (Oberalm, AT); Schiessl; Alois (Marzoll, DE), assigned by: Buck Chemisch-Technische Werke GmbH & Co. (Reichenhall, DE)

"Combustible compositions for generating aerosols, particularly suitable for cloud modification and weather control and aerosolization process", application No. 362680, May 22, 1973, Papee; Henry M. (Rome, IT); Montefinale; Alberto C. (Rome, IT); Petriconi; Gianna L. (Rome, IT); Zawidzky; Tadeusz W. (Ottawa, CA), Consiglio Nazionale delle Richerche (Rome, IT)

"Method for opaquing visible and infrared radiance and smoke-producing ammunition which implements this method", application No. 517940, July 27, 1983, to: Espagnacq; Andre (Bourges, FR); Sauvestre; Gerard D. (Bourges, FR), assigned by: Etat Francais (Paris, FR)

"Pyrotechnic smoke charge with preset breaking points and channel igniter", application No. 293909, August 18, 1981, to: Weber; Manfred (Eisenberg, DE); Hinzmann; Friedmar (Eisenberg, DE), assigned by: Pyrotechnische Fabrik F. Feistel GmbH & Co., KG (Gollheim, DE)

"White smoke spotting composition for training ammunition", application No. 399601, July 19, 1982, to: Knapp; Charles A. (Wayne, NJ), assigned by: The United States of America as represented by the Secretary of the Army (Washington, DC)

"*Pyrotechnic* composition for producing IR-radiation", application No. 339999, January 10, 2003, to: Koch; Ernst-Christian (Kaiserslautern, DE), assigned by: Diehl Munitionssysteme GmbH & Co. KG (Rothenbach, DE)

"Gun powder substituted composition and method", application No. 437,965, November 1st, 1982, to: Earl F. Kurtz, of Longmont, CO

"Pyrotechnic composition containing nickel or aluminum", serial No. 726,548, May 3rd, 1968, to: Horace H. Helms, Jr., of Silver Spring Md, and Alexander G. Rozner, of Bethesda, Md, assigned by: The United States Navy

"Aluminothermic reaction mixture based on copper oxide and iron oxide", application No. 471, 757, May 20th, 1974, to: Theodore Finster, of Hattinfgen Germany, and Horst Schumann, of Mulheim, Germany, assigned by: Th. Goldschmidt AG,

"Welding composition", serial No. 850,105, November 2nd, 1959, to: Rolf E. Rylander, of Cleveland OH, and Lynn J. Ebert, of Euclid, OH, assigned by: Erico Products, Inc.

"Heat producing mixtures", serial No. 3,262, January 19th, 1960, to: Albert Stanley, of John Cross, Birmingham, England, assigned by: Foundry Services International Limited

"Thermite mixture", serial No. 510,372, October 25th, 1921, to: Glenn Walter Merrefeild, of Johnstown, PA

"Thermic mixture", serial No. 301,096, February 14th, 1906, to: Hans Goldschmidt, of Essen-on-the-Ruhr, Germany, assigned by: The Firm of the Goldschmidt

"Long-burning pyrotechnic material containing depleted uranium for spotting rifle projectiles", serial No. 167,449, January 19th, 1962, to: Thomas Stevenson, of Huntingdon Valley, PA, assigned by: The United States Army

"Fire Cracker", serial No. 188,362, August 27th, 1917, to: Thomas G. Hitt, of Seattle, Wa

"Consolidated thermite compositions", application No. 533112, September 25, 1995, to: Taylor; Robert D. (Hyrum, UT), assigned by: Morton International, Inc. (Chicago, IL)

"Composition Causing Combustion When Contacted With Water", application No. 825,059, May 15th, 1969, to: Karl Schneider, of Basel Switzerland, assigned by: Scheidemandel-Motard-Werke AG,

"Pyrotechnic composition for delay elements", application No. 238787, February 27, 1981, to: Schulte; Hans (Siegburg, DE); Voges; Christoph (St. Augustin, DE), assigned by: Dynamit Nobel Aktiengesellschaft (Troisdorf, DE)

"Tracer Composition", serial No. 714,919, May 21st, 1924, to: Sterner St. P. Meek, of Philadelphia, PA

"Tracer Composition", serial No. 715,457, May 23rd, 1924, to: Henry C. Pritham, of Upper Derby, PA

"Incendiary Mixture", serial No. 343,571, December 9th, 1919, to: Walter T. Scheele, of Hackensack, NJ, assigned by: To The United States Navy.

"Ignitable compositions", application No. 073649, September 18th, 1970, to: Robert J. Benge, of Waltham Abbey, Great Britain, and Cecil H. Miller, of Woodford Green, England, assigned by: Ministry of technology in Her Britannic Majesty's Government of the United Kingdom.

"Incendiary Mixture", serial No. 343, 570, December 9th, 1919, to: Walter T. Scheele, of Hackensack, NJ, assigned by: The United States Navy.

"Propellant powder", serial No. 667,359, October 8th, 1923, to: Charles R. Franklin, of Dover NJ

"Granular Propellant Containing KNO3 and Unsaturated Ester", application No. 304,948, November 9th, 1972, to: Herbert Leslie Wood, of West Kilbridge, Scotland, assigned by: Imperial Chemical Industries Limited.

"Ignition Mixture", serial No. 250,949, October 11th, 1951, to: Thomas J. Mulqueeny, of Godfrey, ILL, assigned by: Olin Mathleson Chemical Corporation

"Phosphorus-containing compositions", application No. 356,888, May 3rd, 1973, to: Malcolm George Palmer, and Anthony Donald Bal, both of Coseley, England, assigned by: Albright & Wilson Limited

"Fuze powder composition", serial No. 142,721, February 6th, 1950, to: David Hart, of Dover, NJ

"Flare composition", serial No. 41,746, July 31st, 1948, to: Herbert C. Clauser, and Robert S. Long, both of Westerville, OH, assigned by: Mesne assignments

"Incendiary with high penetrating power", serial No. 452, 079, July 23rd, 1942, to: Albert Grobstein, of Washington DC

"Pyrotechnic composition and device containing such composition", application No. 451150, March 14th, 1974, to: Jean Rene Duguet, of Sarniguet, France, and Marie Louise Sanmartin, of Semeac, France.

"Dry exothermic composition containing fibrous material having oxidizer salt absorbed therein", serial No. 292,715, July 3rd, 1963, to: Edward John Jago, of Cleveland, OH, assigned by: Foseco Trading A.G.

"Pyrotechnic composition for generating lead based smoke", application No. 773,694, October 28th, 1968, to: Duane M. Johnson, of Bicknell, IN, and Donald R. Hazelton, of Winslow, IN, assigned by: The United States Navy

"Ammonium nitrate propellant compositions", application No. 797,697, February 7th, 1969, to: Lionel A. Henderson, of Columbus, Ohio, assigned by: Standard Oil Company, Chicago, Ill.

"Pyrotechnic composition", serial No. 772,067, October 28th, 1968, to: Duane M. Johnson, Bicknell, and Donald R. Razelton, both of Winslow, IN, assigned by: The United States Navy

"Pyrotechnic composition for colored smoke production", serial No. 63,033, August 11th, 1970, to: Frank C. Gunderloy, of Santa Susana, CA, Charles L. Hamermesh, of Tarzana, CA, and Ross I. Wagner, of Woodland Hills, CA, assigned by: North American Rockwell Corporation

"Flare composition", serial No. 78,642, October 6th, 1970, to: George A. Lane, of Midland MI, and William Arthur Smith, of Westland, MI, assigned by: The Dow Chemical Company

"Solid propellant containing cross-linked diamine-terminated polyglycol", serial No. 480,840, August 16th, 1965, to: Don L. Stevens, of Sanford MI, and Harold E. Filter, of Midland, MI, assigned by: The Dow Chemical Company

"Pyrotechnic disseminating composition containing an agent to be disseminated", serial No. 664,919, September 1st, 1967, to: Gary E. Wernette, of Weidman MI, and Erwin M. Jankowiak, of Midland, MI, assigned by: The Dow Chemical Company

"Illuminating flare composition composed of magnesium, sodium nitrate, and an epoxy resin-polyglycol resin binder", serial No. 657,726, July 31st, 1967, to: Bernard E. Douda, of Bloomfeild, IN, assigned by: The United Sates Navy

"Re-ignitable Match", serial No. 439,947, March 15th, 1965, to: John Burton Tigrett, of Jackson, Tenn, and Voorhis F. Wigal, of Jackson, Tenn, assigned by: said Tigrett

"Calcium containing pyrotechnic compositions for high altitudes", serial No. Seymour Lopatin, of Dover, NJ, and David Hart, of Dover, NJ, by Ruth Hart, of Dover, NJ, assigned by: The United States Army

"Solid propellant", serial No. 181,794, March 22nd, 1962, to: Theodore C. Parker, of Sunnyvale CA, and William H. Colburn, Jr., of Irvington, CA, assigned by: General Precision, Inc.

""Polymeric base propellant compositions containing lithium fluoride catalyst", serial No. 374,214, June 10th, 1964, to: Marvin Duane Horton, of Provo Utah, assigned by: The United States Navy

"Solid combustible composition containing epoxy resin", serial No. 151,165, November 9th, 1961, to: Malcolm E. Pruitt, Wallace T. McMichael, and Elmer L. Pendleton, all of Lake Jackson, TX, assigned by: The Dow Chemical Company

"In situ dye smoke", application No. 057888, May 22, 1987, to: Reed, Jr.; Russell (Ridgecrest, CA); Ramnarace; Jawaharlal (Fort Washington, MD), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Solid propellant composition with a polyurethane binder", application No. 791,540, January 10th, 1969, to: Adolf E. Oberth, of Fair Oaks CA, and Rolf S. Bruenner, of Orangevale, CA, assigned by: Aerojet-General Corporation

"Composite modified double base propellant with metal oxide stabilizer", application No. 362,980, May 23rd, 1973, to: Dominic A. Berta, of Wilmington, Del., assigned by: The United Sates Navy

"Modified double base propellants with diisocyante crosslinker", application No. 202,355, June 8th, 1962, to: Donald E. Elrick, assigned by: The United States Navy

"High solids ratio solid rocket motor propellant grains and method of construction thereof", application No. 165641, March 8, 1988, to: Hightower, Jr.; James O. (Huntsville, AL); Sato; Tomio (Huntsville, AL); Hamner; James W. (Huntsville, AL); Rector; Carl M. (Brownsboro, AL), assigned by: Morton Thiokol, Inc. (Chicago, IL)

"High performance, low cost solid propellant compositions producing halogen free exhaust", application No. 531728, June 1, 1990, to: Doll; Daniel W. (N. Ogden, UT); Lund; Gary K. (Ogden, UT), assigned by: Thiokol Corporation (Ogden, UT)

"Polyurethane propellant", application No. 212,762, July 24th, 1962, to: Peter L. Nichols, Jr., of Sacramento, Ca, assigned by: The United Sates Army

"Composite propellant containing molybdenum to reduce electromagnetic radiation interference in combustion products", application No. 657,001, July 31st, 1967, to: Howard G. Cutforth, of Los Altos, CA, Clarence A. Le Febvre, and Melvin E. Steinle, both of San Jose, CA, assigned by: United Aircraft Corporation

"Ignition composition", application No. 870674, May 22, 1986, to: Mackenzie; Gerald L. (Port Tobacco, MD); Petri; Robert O. (La Plata, MD); Rose; James E. (Bryans Road, MD), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Pyrotechnic composition", application No. 323436, November 20, 1981, to: Olander; Donald E. (Huntington Beach, CA); Petersen; Donald W. (Tehachapi, CA), assigned by: Hi-Shear Corporation (Torrance, CA)

"High density impulse solid propellant", application No. 099967, March 31, 1961, to: Kaufman; Martin H. (China Lake, CA); Stang; Peter L. (China Lake, CA), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Compositions for producing flickering signals", application No. 433645, January 16, 1974, to: Cornia; Richard P. (Logan, UT); Reed, Jr.; Russell (Ridgecrest, CA), assigned by: Thiokol Corporation (Newton, PA)

"Propellant pressure burning rate slope modification", application No. 293,258, September 25th, 1972, to: Martin H. Kaufman, of China Lake, CA, assigned by: The United States Navy

"Gas generating compositions", application No. 187797, September 16, 1980, to: Jackson, Jr.; Charles H.

"Manufacture of match-striking compositions", serial No. 89,223, February 18th, 1926, to: Herbert William Robinson, of West Bromwich, England

"Self-hardening pyrotechnic composition", serial No. 121,216, October 13th, 1949, to: David Hart and Hentry J. Eppig, both of Dover, NJ, and William J. Powers, of Wharton, NJ

"Pyrotechnic masses", serial No. 490,063, February, 23rd, 1955, to: Ronald Gibson Hall, of Hemel Hempstead, England, assigned by Brock's Crystals Palace Fireworks Limited

"Propellant powder", serial No. 231,648, June 14th, 1951, to: Don W. Ryker, of Alton, ILL, and Gilbert R. Cox, both of Creve Coeur, MO, assigned by: Olin Mathieson Chemical Corporation

"Solid composite propellant containing polysulfide rubber fuel binder", serial No. 714,127, December 5th, 1946, to: Charles E. Bartley, of Altadena, CA, assigned by: California Institute Research Foundation

"Solid composite propellants containing lithium perchlorate and polyamide polymers", serial No. 719,502, March 6th, 1958, to: Ross M. Hedrick, and Edward H. Mottus, both of Dayton, OH, assigned by: Monsanto Chemical Company

"Solid composite propellants with burning rate catalyst", serial No. 638,176, February 4th, 1957, to: Willard M. St. John, Jr., of Waco, TX, assigned by Phillips Petroleum Company

"Pyrotechnic compound", serial No. 507,306, April 12th, 1894, to: John Agostini, of NY, NY

"Fireworks and method of making same", serial No. 848,979, July 3rd, 1914, to: Aaron Jedel, of New York, NY

"Manufacture of solid propellants", serial No. 475,000, December 13th, 1954, to: Howard, G. Cutforth, of Bartlesville, OK, assigned by: Phillips Petroleum Company

"Composite rubber base propellants and process of preparation employing non-sulfur metallic curing agents", serial No. 622,741, November 19th, 1956, to: Eugene D. Guth, of Bartlesville, OK, assigned by: Phillips Petroleum Company

"Propellant and gas producing compositions of elastic gels containing inorganic oxidizing salts", serial No. 529,342, August 18th, 1955, to: Harry R. Ferguson of Morrisville, PA, assigned by: Thiokol Chemical Corporation

"Solid rocket propellants containing polylactams", serial No. 719,501, March 6th, 1958, to: Ross M. Hedrick and Edward H. Mottus, both of Dayton, OH, assigned by: Monsanto Chemical Company

"Gunpowder", serial No. 560,699, August 27th, 1895, to: Edward Dickson, of Oak Lake, Canada

"Auto ignition system for airbag inflator", application No. 739582, October 30, 1996, to: Seeger; Donald Edwin (Lakeland, FL), assigned by: Breed Automotive Technology, Inc. (Lakeland, FL)

"Ignition compositions for inflator gas generators", application No. 405384, March 15, 1995, to: Khandhadia; Paresh S. (Rochester Hills, MI), assigned by: Automotive Systems Laboratory, Inc. (Farmington Hills, MI)

"Electric primer with intrinsic conductive mix", application No. 348440, May 8, 1989, to: Mei; George C. (Creve Coeur, MO), assigned by: Olin Corporation (Stamford, CT)

"Tracer mixture for use with laser hardened optics", application No. 358290, December 19, 1994, to: Doris; Thomas A. (Sparta, NJ); Martin; Raymond (Tallahassee, FL), assigned by: The United States of America as represented by the Secretary of the Army (Washington, DC)

"Torch fuse-lighter", serial No, 467,130, May 5th, 1921, to: Evelyn Paul Aurand, of Tamaque, PA, assigned by: Atlas Powder Company

"Propellant powder", serial No. 667,359, October 8th, 1923, to: Charles R. Franklin, of Dover, NJ

"Pyrotechnic compound", serial No. 612,141, November 14th, 1896, to: Ernst Leusmann, of Hanover, Germany

"Composition for detonators", serial No. 699,329, December 15th, 1998, to: George Percy Bickford Smith, of Helstone, England

"Detonating composition", serial No. 84,463, December 2nd, 1901, to: Hans Von Dahmen, of Vienna Austria-Hungary

"Smoke producing compound", serial No. 135,943, December 9th, 1916, to: Walter Arthur, of Philadelphia, PA

"Composition for railway signal torpedoes", serial No. 415,264, October 7th, 1920, to: Louis S. Ross, of Newtonville, MA, assigned by: Central Railway Signal Company

"Combustible composition", serial No. 82,120, January 18th, 1926, to: Sterner St. P. Meek, of Philadelphia, PA

"Non explosive pyrotechnic composition", serial No. 73,768, April 10th, 1936, to: George C. Hale, of Dover, NJ

"Production of chromium-bearing reaction mixtures and alloys", serial No. 301,375, October 26th, 1939, to: Marvin J. Udy, of Niagara, NY

"Metal chloride screening smoke mixture", serial No. 558,610, October 13th, 1944, to: John C. Bailar, Jr., and Robert W. Parry, both of Urbana, ILL., assigned by: The United States Navy

"Pelleted igniter composition and method of manufacture", serial No. 592,995, June 21st, 1956, to: Liles G. Herring, of McGregor, TX, assigned by: Phillips Petroleum Company

"Exothermic compositions containing perlite", serial No. 204,633, June 22nd, 1962, to: John P. Walsh and Harold F. Bishop, both of Conneaut, OH, assigned by: Exomet Incorporated

"Gasless ignition composition for solid rocket propellants", serial No. 167,193, January 18th, 1962, to: Barnet R. Adelman, of Atherton, CA, assigned by: United States Army

"Smoke-making compound for signal-rockets", serial No. 292,353, April 24th, 1919, to: Robert Clyde Gowdy, of Cincinnati, OH, assigned by: Government of the United States

"Chemical composition for producing heat", serial No. 139,613, September 21st, 1961, to: Albert T. Camp and Gerald L. MacKenzie, both of Redlands, CA, assigned by: mesne assignments, to Lockheed Aircraft Corporation.

"Solid rocket propellant composition", serial No. 566,103, February 17th, 1956, to: Joe M. Burton, of McGregor, TX, assigned by: Phillips Petroleum Company

"Composite propellants containing activated carbon", serial No. 801,392, March 23rd, 1959, to: Myron L. Dickey, of Whittier, CA, assigned by: Phillips Petroleum Company

"Solid composite rubber base ammonium nitrate propellant cured with metal oxide", serial No. 574,042, March 26th, 1956, to: Barney W. Williams, of McGregor, TX, David R. Smith, of Bartlesville, OK, and Wallace T. McMichael, of Lake Jackson, TX, assigned by: Phillips Petroleum Company.

"Improvement in gunpowder", serial No. 17,321, May 19th, 1857, to: Lammot Du Pont, of Wilmington, Delaware

"Improved composition for friction-matches", serial No. 50,370, October 10th, 1865, to: Louis Lanszweert, of San Francisco, CA

"Gas generating compositions", serial No. 504,117, April 26th, 1955, to: Paul O. Marti, Jr., of Hammond, IN, assigned by: Standard Oil Company

"Flash-lite composition", serial No. 265,806, to: Arthur Eichengrun, of Elberfeld, Germany, assigned by: Farbenfabriken, of Elberfeld, Co.

"Thermic mixture", serial No. 301,096, February 14th, 1906, to: Hans Goldschmidt, of Essen-on-the-ruhr, Germany, assigned by: The firm of the gold Schmidt,

"Manufacture of thermic mixtures", serial No. 294,971, January 6th, 1906, to: Hans Goldschmidt, of Essen-on-the-ruhr, Germany, assigned by: The firm of the goldschmidt

"Combustible mixture for producing actinic light", serial No. 446,060, July 30th, 1908, to: Carl Bethge, of Berlin Germany

"Composition of matter for the generation of heat", serial No. 262,183, May 25th, 1905, to: Frank J. Tone, of Niagara Falls, NY, assigned by: The Carborundum Company

"Composition for match-heads", serial No. 54,310, October 6th, 1915, to: William A. Fairburn, of Short Hills, NJ, assigned by: The Diamond Match Company

"Pyrotechnic composition", serial No. 461,955, April 16th, 1921, to: Robert R.Fulton, of Indian Head, IN

"Thermite mixture", serial No. 510,372, October 25th, 1921, to: Glenn Walter Merefield of Johnstown, PA

"Igniting mixture for tracer compositions", serial No. 670,096, October 22nd, 1923, to: Louise Hendler, of Philadelphia, PA, assigned by: Secretary of War, The United States of America

"Delay powder", serial No. 586,063, January 11th, 1932, to: George C. Hale, of The United States Army, of Dover, NJ

"Primer composition", serial No. 258,724, February 27th, 1939, to: George U. Graff, of Washington, DC

"Delay compositions for electric blasting caps", serial No. 25,366, May 6th, 1948, to: Hugh Mowat Kerr, of Brownsburg, Quebec, Canada, and Cecil R.L. Hall, of Saltcoats, Scotland, assigned by: Canadian Industries Limited

"Ignition composition", serial No. 62,878, December 1st, 1948, to: Charles Philip Spaeth, of Woodbury, NJ, and Charles Pierce Williams, Of Pitman, NJ, assigned by: E.I. du Pont de Nemours & Company

"Igniting composition and method of preparing same" serial No. 228,962, May 29th, 1951, to: Sidney J. Magram, of Baltimore MD, and John J. Blissel, of Kingsville, MD

"Dark burning igniter composition, serial No. 130,584, December 1st, 1949, to: Raymond H. Heiskell, Compton, CA

"Delay composition for delay electric detonators", serial No. 281,029, April 7th, 1952, to: Idwal O. Lewis, of Ardrossan, Scotland, assigned by: Imperial Chemical Industries Limited

"Improvement in percussion-powder", Letters Patent No. 18,016, August 18th, 1857, to: Magnus Kling, of Reading, PA

"Composition for Bengal lights", letters patent No. 323,662, August 4th, 1885, to: Charles Gerhard, of New York, NY

"Solidifying colored fire", serial No. 311,992, May 24th, 1889, to: Hermann O. Frank, of Milwaukee, WI

"Exothermic reaction mixture for producing a molten copper alloy", serial No. 331,634, January 16th, 1953, to: Donald J. Burke, of Cleveland, OH, assigned by: Erico Products, Inc.

"Delay compositions", serial No. 574,663, March 29th, 1956, to: Hugh M. Kerr, of Cartierville, Quebec, Canada, and Gordon Towell, of Brownsburg, Quebec, Canada, assigned by: Canadian Industries Limited

"Hydrogen gas generating propellant compositions", serial No. 394,481, November 25th, 1953, to: John A. Fitzpatrick, of Washington DC, assigned by: Airtronics Inc.

"Delay fuse", serial No. 631,468, December 31st, 1956, to: David T. Zebree, of Kingston, NY, assigned by: Hercules Powder Company

"Improvement in preparation of granulated gunpowder to serve as charges for fire-arms", letters patent No. 33,069, August 20th, 1861, to: John Harcourt Brown, of Abbey Mill House, Romsey, England

"Composition for tracer unit", serial No. 35,960, June 29th, 1948, to: Raymond H. Heiskell, of Compton, CA

"Propellant system", serial No. 719,116, March 4th, 1958, to: Thomas L. Fritzlen, of Henrico County, VA, Assigned by: Reynolds, Metals Company

"Material for welding aluminum and other metals" serial No. 503,569, April 25th, 1955, to: Melvin F. Rejdak, of Cleveland, OH, assigned by: Erico Products, Inc.

"Delay compositions for delay electric detonators", serial No. 147,146,October 24th, 1961, to: Thomas Z. Ball, of New Ringgold, PA, and William D. Trevorrow, of Tamaqua, PA, assigned by: Atlas Chemical Industries, Inc.

"Delay compositions for delay electric detonators", serial No. 147,147, October 24th, 1961, to: Thomas Z. Ball, of New Ringgold, PA, and William D. Trevorrow, of Tamaqua, PA, assigned by: Atlas Chemical Industries, Inc.

"Gasless igniter composition", serial No. 319,890, October 29th, 1963, to: Earl E. Kilmer, of College Park, MD, assigned by: United States Navy

"Flameproof delay composition with a delayed-action time in the milliseconds range", serial No. 395,047, September 8th, 1964. to: Helmut Menke, of Troisdorf, Germany, assigned by: Dynamite Nobel Aktiengesellschaft

"Pyrotechnic composition", serial No. 49,980, June 25th, 1970, to: Horace H. Helms, Jr., of Silver Springs MD, and Alexander G. Rozner, of Bethesda, MD, assigned by: United States Navy

"Propellant powder", serial No. 721,203, June 20th, 1924, to: Arthur S. O'Neil, of Alton, IL, assigned by: Western Cartridge Company

"Progressive burning smokeless powder", serial No. 179,764, December 14th, 1937, to: Lewis C. Weldin, of Kenvil, NJ, assigned by: Hercules Powder Company

"Priming composition", serial No. 403,535, July 22nd, 1941, to: Willi Brun, of Bridgeport, Conn., assigned by: Remington Arms Company

"Conductive priming mixture", serial No. 740,170, June 5th, 1958, to: Thomas Q. Ciccone, of Langhorne, PA, assigned by: The United States Army

"Composite solid propellant containing preshaped (salt – metal – burning rate controller) particles", serial No. 698,389, January 17th, 1968, to: Kiroku Yamazaki, of Tokyo, Japan, and Kazuo Kishi, of Saitama-ken, Japan

"Aluminum-iron oxide incendiary composition containing a (cyclopentadienyl) iron compound", serial No. 600,006, December 6th, 1966, to: Urho Albert Lehikoinen, of Detroit, MI, assigned by: Ethyl corporation

"Detonating firework composition", serial No. 259,377, March 5th, 1928, to: William F. Gehrig, of Berkley Heights, NJ

"Rocket propellant", serial No. 477,294, December 23rd, 1954, James R. Eiszner, of Park Forest, ILL., and William G. Stanley, of Hammond, IN, assigned by: Standard Oil Company

"Improved composition for filling shells", letters patent No. 38,424, May 5th, 1863, to: Levi Short, of Philadelphia, PA

"Fireworks", serial No. 413,579, November 30th, 1891, to: Carl Schmidt, of Berlin, Germany, assigned by: Gustav Gillischewski

"Explosive compound", serial No. 170,469, August 22nd, 1903, to: Charles M. Hall, of Niagara Falls, NY

"Process for making alloys", serial No. 736,343, July 21st, 1934, to: William C. Read, of New Rockelle, NY, assigned by: Electro Metallurgical Company

"Pyrotechnic composition", serial No. 689,600, September 15th, 1933, to: Samuel Wiley, of Metuchen, NJ

"Flash powder and method of preparation", serial No. 350,081, August 2nd, 1940, to Clifford A. Nickle, of Schenectady, NY, assigned by: General Electric Company

"Pyrotechnic compositions", serial No. 224,303, August 11th, 1938, to: George J. Schladt, of Dover, NJ, assigned by: The United States army

"Incendiary material", serial No. 466,658, November 23rd, 1942, to: David L. Woodberry, of The United States Army, William W. Howerton, of Bel Air, MD, and Alver Dunbar, of Teaneck, NJ, assigned by: The United Sates Army

"Metallurgy", serial No. 617,447, September 19th, 1945, to: Marvin J. Udy, of Niagara Falls, NY, assigned by: Guaranty Investment Corporation Limited

"Exothermic alloy addition agent", serial No. 419,096, March 26th, 1954, to: Joseph H. Brennan, of Niagara Falls, NY, and Earle R. Saunders, of Grand Island, NY, assigned by: Union Carbide Corporation

"Fuel comprising a mixture of ammonium nitrate and metal particles", serial No. 714,942, February 13th, 1958, to: Harry A. Toulmin, Jr., of Dayton, OH, assigned by: The Commonwealth Engineering Company

"Exothermic compositions containing zinc and ammonium chloride", serial No. 342,287, February 3rd, 1964, to: John E. Claiborne, of Opelousas, LA

"Solid fuel composition", application No. 515,564, June 14th, 1955, to: Seymour A. Genden, of The United States Army

"Thermoplastic composite rocket propellant", application No. 272859, June 12, 1981, to: Allen; Henry C. (Decatur, AL), assigned by: The United States of America as represented by the Secretary of the Army (Washington, DC)

"Projectile containing pyrotechnic composition for reducing base drag thereof", application No. 424,508, December 13th, 1973, to: Walter J. Puchalski, of Southampton, PA, assigned by: The United States Army

"Improved compound for priming electric fuses", letters patent No. 96,465, November 2nd, 1869, to: George M. Mowbray, of Titusvilled, PA

"Match composition", serial No. 686,357, July, 19th, 1898, to: Henri Sevene and Emile David Cahen, of Paris France

"Igniting composition and method of making same", serial No. 136,470, December 24th, 1902, to: Otto Dieffenbach, and Adolf Schafer, of Griesheim-on-the-main, Germany, assigned by: The Firm of Chemische Fabrik Griedheim Electron

"Match-head or similar composition", serial No. 15,072, March 17th, 1915, to: Henry Staier, of New York, NY

"Detonating firework composition", serial No. 238,467, December 7th, 1927, to: William F. Gehrig, of Berkeley Heights, NJ, assigned by: Essex Specialty Co., Inc.

"Detonating firework composition", serial No. 346,498, March 12th, 1929, to: William F. Gehrig, of Berkeley Heights, NJ, assigned by: Essex Specialty Co., Inc.

"Detonating firework composition", serial No. 259,378, March 5th, 1928, to: William F Gehrig, of Berkeley Heights, NJ

"Pyrotechnic device", serial No. 176,833, March 19th, 1927, to: Hans Reihlen, of Karlsruhe, of Germany, assigned by: To Milton M. Adler

"Percussion detonating composition", serial No. 573,524, November 6th, 1931, to: Andre Blanc, of Salaise-sur-Sanne, France

"Pyrotechnic device", serial No. 58,143, January 8th, 1936, to: Jacob D. Neuss, of Woodbridge, NJ, assigned by: Essex Specialty Co

"Explosives", serial No. 593,971, May 15th, 1945, to: Daniel P. O'Brien, of Stamford, Conn.

"Infra-red tracking flare", application No. 757645, October 21, 1997, to: Hahn; George T. (China Lake, CA); Rivette; Paul G. (Baton Rouge, LA); Weldon; Rodney G. (China Lake, CA), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Igniting composition for matches", serial No. 328,565, July, 31st, 1906, to: Louis Stange, of Aachen, Germany, assigned by: The Chemical Industrial Syndicate Limited

"Aluminum ophorite", serial No. 10,982, February 21st, 1925, Donald B. Bradner, of Philadelphia, PA

"Incendiary composition", serial No. 736,932, May 21st, 1958, to: Thomas Stevenson, of Huntington Valley, PA, assigned by: United States Army

"Solid propellant compositions", serial No. 489,732, February 18th, 1955, to: Horace M. Higgins and Calvin A. Gongwer, of Glendora, CA, assigned by: Aerojet-General Corporation

"High temperature ignition composition of tellurium dioxide, aluminum, and carbon black", serial No. 671,044, to: Hubert G. Timmermans, of Manhattan Beach, CA, assigned by: Space Ordnance Systems, Inc.

"Filler rich powder and method of making", serial No. Richard L. Lou, of Rocklin CA, and Arthur Katzakian, Jr. and Stanley C. Burket, both of Sacramento, CA, assigned by: Aerojet-General Corporation

"Gas generator composition and method", application No. 167,943, August 2nd, 1971, to: Hubert G. Timmerman, of Manhattan Beach, CA, and Vincent O. Catanzarite, of Las Vegas, CA, assigned by: Specialty Products Development Corporation

"Solid propellant", serial No. 181,794, March 22nd, 1962, to: Theodore C. Parker, of Sunnyvale, CA, and William H. Colburn, Jr., of Irvington, CA, assigned by: General Precision, Inc.

"Castable ammonium perchlorate propellant compositions", serial No. 241,506, December 3rd, 1962, to: Hans H. Ender, of Buffalo, NY, assigned by: Union Carbide Corporation

"Solvent process for preparing epoxy base propellants", serial No. 337,107, January 10th, 1964, to: Walter S. Baker, Yucaipa, CA, assigned by: United States of Army

"Composite polysulfide propellants containing addictives for producing extremely fast burning", serial No. 330,365, January 8th, 1953, to: John H. Robson III, of China Lake, CA

"Igniter composition for aircraft ejection apparatus", serial No. 470,302, July 7th, 1965, to: Thomas A. Doris, Jr., Palmyra, NJ, and Thomas Q. Ciccone, of Langhorne, PA, assigned by: The United States Army

"Staple containing solid propellant grain and method of preparation", serial No. 511,027, November 30th, 1965, to: David C. Sayles, of Huntsville, AL, assigned by: The United States Army

"High energy solid propellants containing fluoropolymers and metallic fuels", serial No. 53,566, September 1st, 1960, to: Isadore Shapiro, of Beverly Hills, CA, and Albert Cane, of Los Angeles, CA, assigned by: Hughes Tool Company, Aircraft division

"Composite ammonium nitrate propellants containing boron", serial No. 743,465, June 20th, 1958, to: Charles C. Bice, or Bartlesville, OK, assigned by: Phillips Petroleum Company

"Solid composite propellants containing inorganic oxidizing and polymeric quaternary ammonium compounds", serial No. 284,447, April 25th, 1952, to: William B. Reynolds, and James E. Pritchard, from Bartlesville, OK, assigned by: Phillips Petroleum Company

"Burning rate acceleration catalysts for solid propellant compositions", serial No. 508,314, May 13th, 1955, to: Ralph W. Lawrence, of Glendora, CA, assigned by: Aerojet-General Corporation

"Semi-solid rocket fuel with aluminum naphthenate containing about seven percent combined aluminum", serial No. 824,939 July 6th, 1959, to Charles R. Morton, of Summir, NJ, and Gerald J. Horvitz, of Woodmere, NY, and Nicholas J. Nicholas, of Greenlawn, NY, of assigned by: National Research & Development Corporation

"Composite propellant reinforced with nitrogen compounds", serial No. 703,986, December 19th, 1957, to: Reinhard W. Scharf, of McGregor, TX, assigned by: Phillips Petroleum Company

"Incendiary composition", serial No. 555,765, September 25th, 1944, to: William F. Van Loenen, Los Altos, CA, assigned by: mesne assignments, to Kaiser Aluminum & Chemical Corporation

"Improvement in explosive compounds", Letters patent No., 111,642, February 7th, 1871, to: Joseph Hafenegger, of San Francisco, CA

"Process of making explosives", serial No. 699,943, December 21st, 1898, to: Ernest Auguste, of Paris France

"Explosive compound", serial No. 40,208, December 17th, 1900, to: William A. Gill, of Tarrytown, NY, assigned by: Rendrock Powder Company

"Priming mixtures", serial No. 662,086, March 22nd, 1933, to: Joseph Doerfer, and Jacob Doerfer, both of Littleton, CO

"Ignition compositions comprising boron containing salts", serial No. 166,469, January 12th, 1962, to: Robert K. Armstrong, of Glassboro, NJ, assigned by: E.I. du Pont de Nemours and Company

"Igniter containing titanium hydride and potassium perchlorate", application No. 555754, June 1, 1976, to: Dietzel; Russel W. (Albuquerque, NM); Leslie; William B. (Albuquerque, NM), assigned by: The United States of America as represented by the United States Government (Washington, DC)

"Method of inflating an automobile passenger restraint bag", application No. 407268, October 17, 1973, to: Catanzarite; Vincent Owen (Las Vegas, NV), Specialty Products Development Corporation (Medina, OH)

"Chlorite containing pyrotechnic composition and method of inflating an inflatable automobile safety restraint", application No. 856958, December 5, 1977, to: Garner; Eugene F. (Canyon Country, CA); Hamilton; Brian K. (Canyon Country, CA), assigned by: Allied Chemical Corporation (Morris Township, Morris County, NJ)

"Pyrotechnic composition and method of inflating an inflatable automobile safety restraint", application No. 840692, October 11, 1977, to: Garner; Eugene F. (Canyon County, CA), assigned by: Allied Chemical Corporation (Morris Township, Morris County, NJ)

"Ignition enhancer coating compositions for azide propellant", application No. 905828, May 15, 1978, to: Garner; Eugene F. (Canyon County, CA); Hamilton; Brian K. (Canyon County, CA), assigned by: Allied Chemical Corporation (Morris County, Morris Township, NJ)

"Pyrotechnical delay charge", application No. 377888, May 13, 1982, to: Boberg; Tore (Karlskoga, SE), assigned by: Aktiebolaget Bofors (Bofors, SE)

"Incendiary mixture constituted of metals", application No. 555708, November 28, 1983, to: Klober; Martin (Nuremberg, DE), assigned by: Diehl GmbH & Co. (DE)

"Primer mix, percussion primer and method for initiating combustion", application No. 587344, 8 March, 1984, to: Yates, Jr.; Donald N. (Katy, TX); Oestrich; Michael (Katy, TX), assigned by: GEO Vann, Inc. (Houston, TX)

"Porous propellant grain and method of making same", application No. 062547, June 15, 1987, to: Pietz; John F. (Mesa, AZ), Talley Industries, Inc. (Meza, AZ)

"Improved fuse composition", Letters patent No. 103,931, June 7th, 1870, to: William H. Rogers, of Brooklyn, NY

"Improvement in the manufacture of safety matches", letters patent No. 149,324, April 7th, 1874, to: L. Otto P. Meyer, of Newtown, Conn.

"Inflammable composition for matches", serial No. 322,115, August 27th, 1889, to: Johann Lutz, of Vienna, Austria-Hungary, assigned by: Paul Oltosy & Sohne

"Process for producing damp-proof matches", serial No. 392,799, June 29th, 1920, to: Rene Dubrisay, of Paris, France

"Self lighting cigarette", serial No. 90,012, July 10th, 1936, to: John Biddle, of Whitwick, England, assigned by: Morris Margolis

"Smoke and illumination signal", application No. 512262, October 4, 1974, to: Beatty; Bobby D. (Bloomfield, IN); Daniel; Russell D. (Bloomington, IN); Humerickhouse; Billy J. (Odon, IN); Norris; Gary G. (Burns City, IN), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Cinnamic acid containing pyrotechnic smoke composition", application No. 725606, September 22, 1976, to: Douda; Bernard E. (Bloomfield, IN); Tanner, Jr.; John E. (Bloomington, IN), assigned by: The United States of America as represented by the Secretary of the Navy (Washington, DC)

"Pyrotechnic filled molding powder", application No. 804190, June 6, 1977, to: Hartzel; Lawrence W. (Dayton, OH); Kettling; George E. (Cincinnati, OH), assigned by: The United States of America as represented by the United States (Washington, DC)

"Solid propellant motor", application No. 048621, May 13, 1970, to: Shafer; John I. (Pasadena, CA); Marsh, Jr.; Harold E. (La Canada, CA), assigned by: The United States of America as represented by the Administrator of the (Washington, DC)

"Pyrotechnic composition", application No. 323436, November 20, 1981, to: Olander; Donald E. (Huntington Beach, CA); Petersen; Donald W. (Tehachapi, CA), assigned by: Hi-Shear Corporation (Torrance, CA)

"Process for preparing sterile solid propellants", serial No. 440,033, March 15th, 1965, to: James E. Webb, Administrator at NASA, invented by Lawrence C. Montgomery and Frank A. Morelli

"Purification of combustion catalysts and solid propellant compositions containing the same", application No. 356676, May 2, 1973, to: Rudy; Thomas P. (Saratoga, CA); Nakagawa; Toshio W. (San Jose, CA), assigned by: United Technologies Corporation (E. Hartford, CT)

"Method for making primer constituents", application No. 182362, August 29, 1980, to: Urs; Venkataramaraj S. (Godfrey, IL), assigned by: Olin Corporation (Stamford, CT)

"Granular propellant powder based on nitrocellulose, oily nitrate ester and polyvinyl nitrate, and process", application No. 100646, to: Zeller; Bernard M. (Brunoy, FR); Couturier; Rene J. (Mennecy, FR); Tribot; Robert A. (Hiersac, FR), assigned by: Societe Nationale des Poudres et Explosifs (Paris, FR)

"Method for binary propellant", application No. 183856, September 3, 1980, to: Levenson; Michael K. (Tempe, AZ), assigned by: Pyrodex Corporation (Shawnee Mission, KS)

"Increasing burning rate of solid propellants by electric field effects", application No. 222400, January 7, 1981, to: Sayles; David C. (Huntsville, AL), assigned by: The United States of America as represented by the Secretary of the Army (Washington, DC)

"Smokeless powder", serial No. 281,360, May 28th, 1928, to: Sereno G. Norton, of Brunswick, GA, assigned by: Hercules Powder Company

"Smokeless powder", serial No. 485,417, September 13th, 1893, Mason E. Leonard, of Manchester, NJ, assigned by: The Leonard Smokeless Powder Company

"Combustible compound", serial No. 611,372, November 7th, 1896, to: David Duncan Esson, of Faversham England, assigned by: Esson Motor, Limited

"Smokeless gunpowder", serial No. 96,175, February 28th, 1902, to: Carl Olof Lundholm, of Stevenston, Scotland

"Smokeless powder", serial No. 327,367, July 23rd, 1906, to: Allan Thomas Cocking, of Four Oaks, Birmingham, England

"Smokeless gunpowder", serial No. 329,801, August 9th, 1906, to: Conrad Paul Hubert Claessen, of Wilmersdorf, Berlin Germany

"Gunpowder", serial No. 335,819, September 22nd, 1906, to: Conrad Paul Hubert Claessen, of Berlin Germany

"Propellant mixing", serial No. 64,691, October 25th, 1960, to: Willem Schaafsma, Los Altos, CA assigned by: United Aircraft Corporation

"Nitronium perchlorate propellant composition", serial No. 268,457, March 27th, 1963, to: Thomas N. Scortia, of Los Gatos, and Cornelius J. McCormick, of Palo Alto, CA, assigned by: United Aircraft Corporation

"Solid propellant compositions having epoxy cured, carboxy-terminated rubber binder", application No. 667623, September 6, 1967, to: Elrick; Donald E. (Rawlings, MD); Gilbert; Harry (Cumberland, MD), assigned by: Hercules Incorporated (Wilmington, DE)

"Incendiary Gels", serial No. 508,632, November 1st, 1943 to: Louis F. Fieser, of Belmont, MASS, assigned by: The United States Army

"Process of preparing a Napalm composition containing a finely divided inert carrier", serial No. 250,560, October 9th, 1951, to: Albert O. Herron of Cheshire, Conn, assigned by: Safety Fuel & Chemical Corporation

"Solid propellant with burning rate catalyst", application No. 678523, November 8th, 1977, to: Richard A. Biddle, of Newark, DE, assigned by: Thiokol Corporation

"Inhibited solid propellant composition containing beryllium hydride", application no. 849272, August 5th, 1969, to: T.O. Paine, of Administrator of the National Aeronautics and Space, and Wallace w. Thompson

"Smoke agent", serial no. 562,328, November 7th, 1944, to: John P. Clay and Henry B Elkins, assigned by: The United States Army

"Flash-light composition", serial no. 585,011, March 26th, 1896, to: York Schwartz. Of Hanover, Germany

"Process for manufacturing of fuses and composition therefore", serial no. 6,827, February 6th, 1948, to: Henryk Zenftman and Joseph E. Forlin, both of Salt coats, Scotland, assigned by: Imperial Chemical Industries Limited

"Nitrocellulose compositions and method for making same", serial No. 464,899, October 26th, 1954, to: Lester L. Well, of Alexandria, VA, assigned by: Atlantic Research Corporation

"Nitroguanidine propellant composition and process of preparation", serial no. 83,849, January 19th, 1961, to: Russell L. Trask, or Morris Plains, NJ, Samual Sage, of Bronx, NY, and Isidore G. Nadel, of Little Falls, NJ, assigned by: United States Of America

"Gas generating Material", application number: 547623, June 28th, 1990, to: George W. Goetz, of Rochester Hills, MD, and Thomas H. Vos, of Rochester, MI, assigned by: TRW Vehicle Safety System, Inc.

"Fuse powder for metal delays", Serial No. 609,488, May 5th, 1932, to: Jean Piccard, of Marshalltown, DEL, assigned by: Hercules Powder Company

"Plasticized nitrocellulose propellant composition containing aluminum hydride and nitronium perchlorate", Application 465,252, filed: June 16th, 1965, to: James P. Flynn, George A. Lane, and John J. Plonmer, all of Midland, MI, assigned by: Adamas Carbide Corporation

"Composite Solid Propellant with additive to improve the mechanical properties thereof", Serial No. 105,938, January 12th, 1971, to: Henry C. Allen, of Decatur, Alabama, assigned by: The United States of America as represented by the US Army

"Extrusion aids for extrudable solid compositions", Serial No. 783,646, filed December 19th, 1958, to: Charles C. Bice, of Bartlesville, OK, assigned by: Phillips Petroleum Company

"Smokeless powder and process of making same", Serial No. 12,024, March 4th, 1915 to: James Madison Brown, of Johnson City, TN

"Smokeless powder", Serial No. 169,030, August, 10th, 1903, to: James L. Brown, of Indianhead, Maryland, and David P. Moore, of Washington DC, assigned by: Manuel Antonio Gomez Himalaya, of Arcos-de-val-de-vez Portugal

"Composition for fuses and process of making same", Serial No. 175,485, October 2nd, 1903, to: Wilhelm Theodore Unge, of Stockholm, Sweden

"Ignition composition for matches", Serial No. 13,065, April 26th, 1900, to: John Landin and August Jernander, of Stockholm, Sweden

"NH4NO3 Nitrocellulose coated with nitrocellulose and aluminum", application No: 240,299, filed: March 31st, 1972, to: Louis Leneveu, Frank Pierre Antoine Villey-desmeserets, both from Point de Buis, of France, assigned by: Etat Francais represente par le Ministre d'Etat Charge de la Defense Nationale-Delegation Ministerielle pour l'Armement-Direction des Pourders

"Signal torch", serial No. 758,343, December 19th, 1934, to: Harry E. Sherman, of Alton, ILL, assigned by: The Equitable Powder Manufacturing Company

"Solid gas generating charge", serial No. 128,240, November 18th, 1949, to: Alexander C. Hutchison, of Saltcoats, Scotland, assigned by: Imperial Chemical Industries Limited

"Propellant bulk smokeless powder", Serial No. 344,244, filed December 11th, 1919, to: Richard G. Woodbridge, Jr., of Wilmington, Delaware, assigned by: E.I. Du Pont De Nemours & Company

"Propellant bulk smokeless powder", Serial No. 360,194, filed February 20th, 1920, to: Richard G. Woodbridge, Jr., of Wilmington, Delaware, assigned by: E.I. Du Pont De Nemours & Company

"Novel Polybasic Propellant", serial No. 180,853, filed by September 15th, 1971, to: helmuth Nolte and Paul Linemann, both of waldkraiburg, Germany, and Walter Hahn, of Aschau, Germany, assigned by: Wasagchemie G.m.b.H., of Munich Germany

"Process for preparing rocket fuel containing polymerized olefins and boron", serial No. 179,889, filed August 16th, 1950, to: Edward Whitworth, of West Kilbride, Scotland, assigned by: Imperial Chemical Industries Limited, UK

"Propellant", serial No. 340,663, March 5th, 1953, to: John D. Clark, of Webster Groves, MO, assigned by: Olin Mathieson Chemical Corporation

"Propellant and process for manufacture", serial No. 263,047, March 3rd, 1939, to: George C. Hale, of Dover, NJ, assigned by: The United States Army

"Propellant powder and process of making the same", serial No. 358,708, May 1st, 1929, to: William E. Wagner, of Alton ILL, assigned by: Western Cartridge Company

"Propellant composition", serial No. 612,967, Filed: October 1st, 1956, to: Frank B. Cramer, of Reseda, CA, assigned by: North American Aviation, Inc.

"Solid rocket propellants containing polylactams", serial No. 719,501, Filed: March 6th, 1958, to: Ross M. Hedrick and Edward H. Mottus, both of Dayton, OH, assigned by: Monsanto Chemical Company

"Slow burning propellant composition", serial No. 767,752, Filed: October 16th, 1958, to: William A. Gey, of China Lake, CA, assigned by: United States of America as represented by the US Navy

"Novel pyrotechnics" serial No. 154,909, filed: November 24th, 1961, to: Martin H. Kaufman, of China Lake, CA, and Julian S. Davidson, of Glendale, CA

"Flare composition", serial No. 566,317, Filed: February 17th, 1956, to: Edgar A. Cadwallader, of Rockville, MD, assigned by: United States Navy

"High Temperature Composite propellant system", serial No. 615,345, Filed: February 13th, 1967, to: Joseph T. Hamrick, of Roanoke County, VA, 24014

"Ignition material containing Tellurium Dioxide, Boron and Fluoropolymeric binder", serial No. 619,567, Filed: March 1st, 1967, to: Frank H. Gardner, of Huntington Beach, CA, assigned by: Space Ordnance Systems, Inc.

"Gas generating compositions containing hydroxyl ammonium oxalate coolants and method for their preparation", serial No. 266,497, filed: July 6th, 1965, to: Ernest S. Sutton, Jr., of Newark, Del, assigned by: Thiokol Chemical Corporation

"Solid composite smokeless slow burning, low flame propellant", serial No. 276,703, Filed: March 14th, 1952, to: George W. Batchelder, of Glendora, CA, assigned by: Mesne Assignments, and Aerojet-General Corporation

"Propellant compositions", serial No. 399,596, Filed: December 21st, 1953, to: George W. Batchelder, of Glendora, CA, and Gilbert A. Zimmerman, of Monrovia, CA, assigned by: Aerojet-General Corporation

"Propellant compositions", serial No. 428,791, Filed: May 10th, 1954, to: Ralph W. Lawrence, of Gelndora, CA, assigned by: Aerojet-General Corporation

"Carboxyl-terminated linear polyester gas-generating composition and method of preparation", serial No. 207,063, Filed: July 2nd, 1962, to: Calvia W. Vriesen, of Brookside, Del, assigned by: Thiokol Chemical Corporation

"Flare composition comprising magnesium, sodium perchlorate, and a ternary organic binder", serial No. 770,380, Filed: October 24th, 1968, to: Yoshiyuki Arikawa, of Destin Fl, and Hal R. Waite, of Walton Beach, Fl, assigned by: Unites States Navy

"Calcium containing pyrotechnic compositions for high altitudes", serial No. 375,596, Filed: June 8th, 1964, to: Seymour Lopatin, of Dover, NJ, and David Hart, of Dover, NJ, assigned by: United States Army

"Ammonium nitrate propellant with low flame temperature exhaust gases", serial No. 210,829, Filed: July 18th, 1962, to: Don E. Kennedy, of Palos Verdes Estates, CA, assigned by: Standard Oil Company

"Nitroguanidine propellant composition and process of preparation", serial No. 83,849, Filed: June 19th, 1961, to: Russell L. Trask, of Morris Plains, NJ, Samuel Sage, of Bronx, NY, and Isidore G. Nadel, of Little Falls, NJ, assigned by: United states Army

"Pyrotechnic composition", serial No. 245,627, Filed: December 18th, 1962, to: Mary M. Williams, of Santa Monica, and Lohr A. Burkardt, of China Lake, CA, assigned by: United states Navy

"Pyrotechnics comprising silver Iodate, Ammonium nitrate, Nitrocellulose, and Nitrate esters, serial No. 609,968, Filed: January, 17th, 1967, to: William G. Finnegan and Lohr A. Burkardt, both of China Lake, CA, assigned by: United states of Navy

"Composite propellants containing activated carbon", serial No. 801,392, Filed: March 23rd, 1959, to Myron L. Dickey, of Whittier, CA, assigned by: Phillips Petroleum Company

"Solid propellant and a process for its preparation", serial No. 725,453, Filed: March 31st, 1958, to: Eugene D. Guth, of Idaho Falls, ID, assigned by: Phillips Petroleum Company

"Self-Hardening pyrotechnic composition", serial No. 121,216, Filed: October 13th, 1949, to: David Hart and Henry J. Eppig, of Dover NJ, and William J. Powers, of Wharton, NJ

"Solid propellant compositions and process for making same", serial No. 183,457, Filed: September 6th, 1950, to: Lester L. Weil, of Alexander, VA, assigned by: Atlantic Research Corporation

"Illuminants", serial No. 749,577, Filed: July 15th, 1958, to: Jean A. M. Brock, of St. Louise, MO, assigned by: Olin Mathieson Chemical Corporation

"Propellant mixing", serial No. 64,691, Filed: October 25th, 1960, to: Willem Schaafsma, of Los Altos, CA, assigned by: United Aircraft Corporation

"Pyrotechnic compound", serial No. 525,611, Filed: October 11th, 1894, to: Charles Gerhard, of Jersey City, NJ

"Pyrotechnic composition", serial No. 343,573, Filed: December 9th, 1919, to: Walter T. Scheele, of Hackensack, NJ, assigned by: United States Navy

"Process of producing match-composition ingredients", serial No. 592,598, Filed: November 16th, 1910, to: Henry Staier, of New York, NY

"Igniting substance", serial No. 307,851, Filed: June 30th, 1919, to: Regino A. Martinez, of Buenos Aires, Argentina, assigned by: Pedro Eugenio Girard

"Pyrotechnic device", serial No. 494,452, Filed: November 8th, 1930, to: Herbert Clauser, of Elkton, MD

"Ignition and priming compound", serial No. 63,555, Filed: February 12th, 1936, to: Mario Palmieri, of South Glastonbury, of Conn, assigned by: one-half to Samuel D. Ehrlich

"Noncorrosive priming compositions", serial No. 194,384, Filed: March 6th, 1938, to: Charles H. Pritham, of Upper Darby, and Ernest R. Rechel, and Thomas Stevenson, both of Philadelphia, PA

"Fuse powder composition", serial No. 535,054, Filed: May 11th, 1944, to: George C. Hale, and David Hart, both of Dover NJ

"Flash powder", serial No. 136,384, Filed: December 11th, 1916, to: John L. Crabtree, of Rochester, NY, assigned by: Eastman Kodak Company

"Pyrotechnic composition", serial No. 456,986, Filed: March 30th, 1921, to: Harry J. Nichols, of Washington, DC

"Delay powder", serial No. 534,289, Filed: May 5th, 1944, to: George C. Hale, of Dover, NJ

"Delay powder", serial No. 632,101, Filed: November 30th, 1945, to: George C. Hale, and David Hart, both of Dover, NJ

"Deflagrating compound", serial No. 228,935, Filed: June 15th, 1880, to: John A. Robinson and Robert H. Dimock, both of New Haven, CONN.

"Match", serial No. 562,426, Filed: June 23rd, 1896, to: Carl Rudolph Adolph George Schwiening, of Bettenhausen, Germany

"Match-paste composition", serial No. 694,216, Filed: October 21st, 1898, to: Gustav Hackel of Vienna Austria, assigned by: Carl Kastner

"Match-composition", serial No. 698,352, Filed: December 5th, 1898, to: Walter G. Cordes, of London England, assigned by: Non-Poisonous "strike anywhere" match syndicate, limited

"Match composition", serial No. 178,891, Filed: October 28th, 1903, to: John A. Wendel, of Milwaukee, WI

"Match composition", serial No. 188,652, Filed: January 11th, 1904, to: Frederick E. Grimm, of Utica, NY

"Match composition", serial No. 206,855, Filed: May 7th, 1904, to: Henry Staier, of Brooklyn, NY

"Pyrotechnic compound", serial No. 524,513, Filed: October 25th, 1909, to: Bernard J. Dever, and Bertram J. Delzeit both of Philadelphia, PA

"Priming composition and method of preparing the same", serial No. 763,071, Filed: April, 23rd, 1913, to: Maurice R. Swope, of Alton, ILL

"Match-head composition", serial No. 298,429, Filed: May 20th, 1919, to: John R. Mardick, of NY, NY

"Gas producing nondetonating composition", serial No. 101,273, Filed: June 24th, 1949, to: James Taylor, and Alexander Cantlay Hutchison, both of Saltscoats, Scotland, assigned by: Imperial Chemical Industries Limited

"Ignition mixture", serial No. 581,538, Filed: March 7th, 1945, to: Joseph, H. McLain, and Theodore A. Ruble, of USA

"Gas producing compositions", serial No. 667,969, Filed: June 25th, 1957, to: Kenneth Urmston Holker, of West Kilbride, Scotland, assigned by: Imperial Chemical Industries Limited, London, England

"Combustible composition", serial No. 638,925, Filed: February 8th, 1957, to: David E. Pearsall, of Avon, CONN, assigned by: Bickford Research Laboratories, INC.

"Fuel and propellant composition", serial No. 721,697, Filed: March 17th, 1958, to: Harry A. Toulmin, Jr., of Dayton, OH, assigned by: The Commonwealth Engineering Company of Ohio

"Tracer mechanism", serial No. 776,655, Filed: November 26th, 1958, to: Nicholas, M. Matusewicz, of Upland, CA, assigned by: United Sates Navy

"Percussion sensitive pyrotechnic or pyrophoric alloy-type priming mixture", serial No. 371,813, Filed: June 1st, 1964, to: Donald S. Foote, of Green Farms, and Richard A. Sahlin, of Fairfield, CONN, assigned by: Remington Arms Company, INC.

"Colored smoke", serial No. 270,576, Filed: January 10th, 1919, to: Edwin C. Weisgerber, of The United states Army

"Composition for matches and process for making same", serial No. 346,111, Filed: December 19th, 1919, to: Manuel Prado P., Santiago, Chile

"Pyrotechnic composition for producing yellow smoke", serial No. 652,430, Filed: January 18th, 1933, to: George U. Graff, of Washington, DC

"Pyrotechnic composition for producing brown smoke", serial No. 652,427, Filed: January 18th, 1933, to: George U. Graff, of Washington DC

"Pyrotechnic composition for producing orange smoke", serial No. 652,431, Filed: January 18th, 1933, to: George U. Graff, of Washington DC

"Pyrotechnic compositions", serial No. 598,539, Filed: March 12th, 1932, to: Joseph B. Decker and Herbert C. Clauser, both of Elkton, MD

"Pyrotechnic composition for producing pink smoke", serial No. 40,796, Filed: September 16th, 1935, to: George U. Graff, of Washington, DC

"Flashlight powder", serial No. 66,751, Filed: March 2nd, 1936, to: Albert Kalber, of Pforzheim, Germany

"Material for use in welding", serial No. 245,954, Filed: December 15th, 1938, to: Charles A. Cadwell, of Cleveland Heights, OH, assigned by: The Electric Railway Improvement Company

"Exothermic mixture", serial No. 338,585, Filed: June 3rd, 1940, to: Walter M. Bruner, of Wilmington, DEL, assigned by: W.G. Shelton Company

"Welding", serial No. 375,099, Filed: January 21st, 1941, to: Charles A. Cadwell, of Cleveland, OH, assigned by: Electric Railway Improvement Company

"Igniter compositions", serial No. 329,111, Filed: December 31st, 1952, to: Franklin B. Clay, of Westport CONN, and Richard A. Sahlin, Fairfield, CONN, assigned by: Remington Arms Company

"Material For Welding Aluminum and other metals, serial No. 554,234, Filed: December 20th, 1955, to: Melvin F. rejdak, of Cleveland, OH, assigned by: Erico Products, INC.

"Pyrotechnic composition", serial No. 729,526, Filed: April 21st, 1958, to: Jean A. M. Brock, of St. Louise, MO, assigned by: Olin Mathieson Chemical Corporation

"Heat producing mixtures", serial No. 3,262, Filed: January 19th, 1960, to: Albert Stanley John Cross, of Birmingham, England, assigned by: Foundry Services International Limited

"Pyrotechnic compositions", serial No. 758,173, Filed: August 27th, 1958, to: Donald E. Olander, of Florissant, MO, assigned by: Universal Match Corporation

"Method of propulsion using solid propellant compositions", serial No. 489,731, Filed: February 18th, 1955, to: Horace M. Higgins, and Calvin A. gongwer, both of Glendora, CA, assigned by: Aerojet-General Corporation

"Metallic composition for production of hygroscopic smoke", serial No. 375,402, Filed: June 15th, 1964, to: Lohr A. Burkardt, and William G. Finnegan, both of China Lake, CA, assigned by: United States Navy

"Pressure compensated pyrotechnic time delay composition", serial No. 147,690, Filed: May 27th, 1971, to: Roswitha Zimmer-Galler, of Niceville, FL, and James E. Rose, of Bryans Road, MD, assigned by: United States Navy

"Pyrotechnic delay compositions containing heavy metal soap", serial No. 236,173, Filed: March 20th, 1972, to: James E. Rose, of Bryans Road, MD, and Roswitha Zimmer-Galler, of Niceville, FL, assigned by: United States Navy

"Thermite composition and method of making", serial No. 234,855, Filed: March 15th, 1972, to: John W. Jones, of Redlands, CA, assigned by: Lockheed Aircraft Corporation

"First fire and igniter composition", serial No. 717,275, Filed: February 24th, 1958, to: David Hart, of Dover, NJ, assigned by: United States Army

"Chemically produced colored smokes", serial No. 767,751, Filed: October 16th, 1958, to: Lohr A. Burkardt, William G. Finnegan, and, Rex L. Smith, all from China Lake, CA

"Hafnium-potassium perchlorate pyrotechnic composition", serial No. 214,147, Filed: August 1st, 1962, to: Robert E. Betts, of Huntsville, Alabama, assigned by: United States Army

"Smokeless ashless signal flare composition containing ammonium perchlorate", serial No. 385,518, Filed: July 27th, 1964, to: James B. McGriffin, of Linton, IND, and William L. Ripley, of Bedford, IND, assigned by: United States Navy

"Zirconium composition with potassium perchlorate and graphite", serial No. 168,555, Filed: January 24th, 1962, to: Charles H. Jackson, of Redondo Beach, CA, assigned by: Hi-Shear Corporation

"Long-burning pyrotechnic material containing depleted uranium for spotting rifle projectiles", serial No. 167,449, Filed: January 19th, 1962, to: Thomas Stevenson, of Huntington Valley, PA, assigned by: United States Army

"Pyrotechnic Compositions", serial No. 155,023, Filed: July 22nd, 1937, to: Charles H. Pritham, of Philadelphia, PA

"Nonluminous pyrotechnic mixture for a projectile", serial No. 35,961, Filed: June 29th, 1948, to: Raymond H. Heiskell, of Compton, CA

"Smoke tracer composition", serial No. 484,599, Filed: January 27th, 1955, to: Thomas Stevenson, of Huntington Valley, PA, and Winton W. Cavell, of Philadelphia, PA, assigned by: United States Army

"Priming mixture", serial No. 489,587, Filed: August 3rd, 1921, to: James E. Burns, of Lowell, MASS

"Propellant powder", serial No. 381,389, Filed: July 26th, 1929, to: Joseph D. McNutt, of New Haven, CONN, assigned by: Mesne Assignments, to Winchester Repeating Arms Company

"Flash Composition", serial No. 609,489, Filed: May 5th, 1932, to: Jean Piccard, of Marshallton, DEL, assigned by: Hercules Powder Company

"Ignition composition", serial No. 623,473, Filed: October 20th, 1945, to: William F. Filbert, of Woodbury, NJ, assigned by: E.I. du Pont de Nemours & Company

"Ammonium nitrate compositions", serial No. 645,641, Filed: March 12th, 1957, to: Aubrey Edward Harper, of Glasgow, Scotland, Kenneth Harrison, of Saltcoats, Scotland, and Edward Graham Cooke, of West Kilbride, Scotland, assigned by: Imperial Chemical Industries Limited, London

"Gas-producing charges suitable for the generation of gas pressure for the operation of mechanical devices and for blasting operations", serial No. 615,195, Filed: September 7th, 1945, to: Alexander Thomson Tyre, of Newton Stewart, Scotland, assigned by: Imperial Chemical Industries Limited

"Process for preparing sterile solid propellants", serial No. 440,033, Filed: March 15th, 1965 to: James E. Webb, Administrator of the National Aeronautics and Space Administration, to Lawrence C. Montgomery and Frank A. Morelli

"Propellant powder to be used in guns and howitzers", serial No. 520,131, Filed: December 5th, 1921, to: John B. Fidlar, of The United States Army

"Propellant powder", serial No. 146,835, Filed: November 6th, 1926, to: Charles H. Keck, of United States Army

"Fleshless propellant powder composition", serial No. 433,717, Filed: March 7th, 1942, to: George Barsky, of NY, NY, assigned by: E.F. Drew & Co., Inc.

"Ignitable Stick", serial No. 358,383, Filed: April 26th, 1929, to: Ferdinand Ringer, of Vienna Austria

"Colored smoke producing composition", serial No. 270,570, Filed: January 10th, 1919, to: Edwin C. Weisgerber, of Washington, D.C

"Process of manufacturing gunpowder", serial No. 209,268, Filed: December 28th, 1917, to: John Buxbaum, of Georgetown, WA

"Slow burning black powder composition", serial No. 288,135, Filed: April 7th, 1919, to: Joseph Percy Gray, of Newport, Delaware, assigned by: E.I. Du Pont de Nemours & Company

"Deflagrating composition", serial No. 534,148, Filed: May 4th, 1944, to: Russel Charrosin Payn, of Watford, England, and Elwyn Jones, of Ardrossan, England, and John Stocks Flanders, of West Kilbride, Scotland, assigned by: Imperial Chemical Industries Limited

"Slow burning powder for fuses, ect.,", serial No. 20,889, Filed: May 10th, 1935, to: David E. Pearsall, of Pittsburgh, PA, assigned by: The Ensign-Bickford Company

"Fuse powder compositions", serial No. 518,242, Filed: January 14th, 1944, to: Harrison H. Holmes, of Woodbury, NJ, and Walter E. Lawson, of Wilmington, DEL, assigned by: E.I. Du Pont De Nemours & Company

"Black powder", serial No. 120,120, Filed: January 11th, 1937, to: William H. Rinkenbach, and Vernon C. Allison, of Dover, NJ, assigned by: The United States Government

"Improvement in compositions for safety blazing fuses", serial No. 153,181, Filed: July 21st, 1874, to: George Carl Julius Schneider, of Erie, PENN

"Colored fire compound", serial No. 309,948, Filed: December 30th, 1884, to: John Herzog, of Baltimore, Maryland

"Composition for Bengal lights", serial No. 363,224, Filed: May 17th, 1887, to: Charles Gerhard, of New York, NY

"Bengal-light compound", serial No. 449,530, Filed: March 31st, 1891, to: Charles Gerhard, of Jersey City, New Jersey

"Gunpowder", serial No. 698,140, Filed: December 3rd, 1898, to: Francis A. Halsey, of San Rafael, CA, assigned by: The Economic Smokeless Powder Company

"Process of preparing pyrotechnics", serial No. 90,816, Filed: January 22nd, 1902, to: Nicholas Del Grande, of Petersburg, Virginia, assigned by: Virginia Fireworks Company

"Semi-smokeless powder", serial No. 305,001, Filed: March 8th, 1906, to: George W. Gentieu, of Peoria, ILL

"Gunpowder", serial No. 222,631, Filed: December 27th, 1886, to: Eduard, Schultze, of Darmstadt, Grand Duchy of Hesse, Germany

"Pyrotechnic compound", serial No. 82,427, Filed: November 15th, 1901, to: Antonio Delgrande, of Petersburg, Virginia, assigned by: Two Thirds, to Robert H. Seabury, and Nicholas Delgrande, both of Petersburg, VA

"Igniter charge for blasting caps", serial No. 582,871, Filed: December 23rd, 1931, to: Lloyd H. Fisher, of Kenvil, NJ, assigned by: Hercules Powder Company

"Improvement in pyrotechnic signals", Filed: July 26th, 1873, to: Alexandre Lamarre, of Paris France, assigned by: Gratiot Washburne

"Material for producing smoke screens", serial No. 271,126, Filed: January 14th, 1919, to: Harry F. French and Raymond C. Benner, both of Fremont, OH, assigned by: National Carbon Company, Inc.

"Chemical compounds", serial No. 161,031, Filed: August 26th, 1937, to: Willi Brun, of Bridgeport, CONN, assigned by: Remington Arms Company, Inc.

"Process of producing an incendiary composition", serial No. 516,313, Filed: December 30th, 1943, to: Morris S. Kharasch, of Chicago, ILL, assigned by: Untied States by the Secretary of War

"Solid propellant containing improved asphalt black", serial No. 244,588, Filed: December 14th, 1962, to: Robert J. Convery, of Wilmington, DEL, assigned by: Sun Oil Company

"Ammonium nitrate composite propellant and method of preparation", serial No. 527,133, Filed: August 8th, 1955, to: Barnet R. Adelman, of Waco, TX, assigned by: Phillips Petroleum Company

"Pyrotechnic disseminating composition", serial No. 667,043, Filed: September 1st, 1967, to: Alan C. Kott, of Mount Pleasant, and Erwin M. Jankowiak, and George A. Lane, both of Midland, Michigan, assigned by: Dow Chemical Company

"Smokeless powder", serial No. 587,846, Filed: April 16th, 1896, to: Francis A. Halsey, of San Rafael, CA

"Cool, nitrocellulose base, non-carbon forming propellant", serial No. 101,020, Filed: April 5th, 1961, to: Beverley W. Lewis, of Hampton, VA, and Carl Boyars, of Silver Spring, MD, assigned by: United States Navy

"Smoke and illumination signal", application No. 512,262, filed: October, 4th, 1974, to: Bobby D. Beatty, of Bloomfield, IN, Russel D. Daniel, of Bloomington, IN, Billy J. Humerickhouse, of Odon, IN, and Gary G. Norris, of Burns City, IN, assigned by: The United States Navy

- TABLE OF IMPORTANT CHEMICALS USED IN PYROTECHNICS -

Important Oxidizers	**Primary use No. 1**	**Primary use No. 2**
1. Ammonium Perchlorate	Solid High Performance Rockets Fuels	High Performance Gun Propellants
2. Ammonium Nitrate	Solid High Performance Rockets Fuels	High Performance Gun Propellants
3. Potassium Chlorate	General and Specialty Pyrotechnic Compositions	Fireworks
4. Potassium Perchlorate	General and Specialty Pyrotechnic Compositions	Gun Propellants
5. Barium Nitrate	Fireworks	General Pyrotechnic Compositions
6. Strontium Nitrate	Fireworks	General Pyrotechnic Compositions
7. Potassium Nitrate	Fireworks	General Pyrotechnic Compositions
8. ADN	High Performance Rocket Fuels	Fireworks
9. Potassium Dichromate	Catalyst in H.P. Rocket Propellants	Catalyst in Gun Propellants
10. Potassium Permanganate	General Pyrotechnic Compositions	
11. Copper Nitrate	Fireworks	
12. Sodium Peroxide	General Pyrotechnic Compositions	
13. Lead Nitrate	Addictive in Gun Propellants	Addictive in General Pyrotechnic Compositions
14. Lead Dioxide	Catalyst in General Pyrotechnic Compositions	
15. Sodium Chlorate	General Pyrotechnic Compositions	
16. Barium Chromate	Catalyst in General Pyrotechnic Compositions	Addictive in specialty Pyrotechnic Compositions
17. Lead-VI-Chromate	Catalyst in General/Specialty Pyrotechnic Compositions	
18. Sodium Nitrate	General Pyrotechnic Compositions	
Important Reducing Agents	**Primary use No. 1**	**Primary use No. 2**
1. Aluminum Powder	High Performance Rocket Propellants	General/Specialty Pyrotechnic Compositions
2. Magnesium grain	General Pyrotechnic Compositions	Fireworks
3. Iron Powder	General Pyrotechnic Compositions	Fireworks
4. Charcoal	General Pyrotechnic Compositions	Fireworks
5. Teflon grain	High Performance Rocket Propellants	Specialty Pyrotechnic Compositions
6. PVC grain	General Pyrotechnic Compositions	Fireworks
7. Sodium hypophosphite	Catalyst in General Pyrotechnic Compositions	
8. Lampblack	General Pyrotechnic Compositions	Fireworks
9. Gum Arabic	General Pyrotechnic Compositions	Fireworks
10. Shellac	General Pyrotechnic Compositions	Fireworks
11. Boron powder	Gun Propellants	Addictive in H.P. Rocket Propellants
12. Hexamine	Fuel in Rocket Propellants	General/Specialty Pyrotechnic Compositions
13. Red Phosphorus/Phosphide Salts	General/Specialty Pyrotechnic Compositions	Fireworks
14. Antimony Sulfides/Sulfide Salts	General Pyrotechnic Compositions	Fireworks
Important Addictive Agents	**Primary use No. 1**	**Primary use No. 2**
1. Ammonium Chloride	General/Specialty Pyrotechnic Compositions	Fireworks
2. Organic copper salts	Catalyst in H.P. Rocket Fuels	Catalyst in Specialty Pyrotechnic Compositions
3. Organic Iron salts	Catalyst in H.P. Rocket Fuels	Catalyst in General Pyrotechnic Compositions
4. Iron Oxides	General Pyrotechnic Compositions	Catalyst in General/specialty Pyrotechnic Compositions
5. Bismuth oxides	Catalyst in Specialty Pyrotechnic Compositions	

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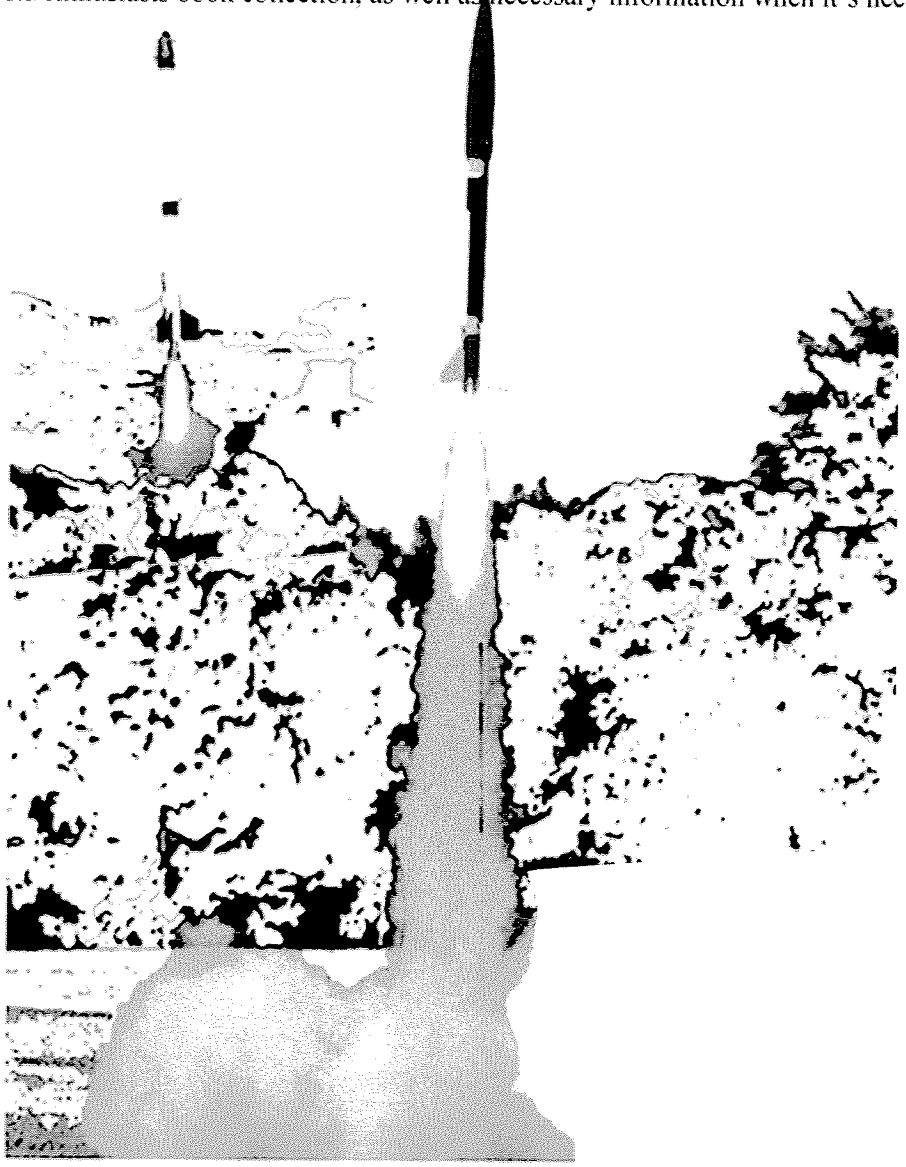
THE PREPARATORY MANUAL OF BLACK POWDER AND PYROTECHNICS

600+ pages, 70+ illustrations, and data tables

The Preparatory Manual of Black Powder and Pyrotechnics is a new Handbook discussing the world's most commonly used pyrotechnic compositions. The book contains multiple sections dividing the area of pyrotechnics into various levels. Black Powder is the first level, followed by High Performance rocket propellants and gun propellants, then followed by General pyrotechnic compositions. Specialty and Experimental compositions take up the rear, followed by Fireworks. All compositions are discussed in great detail with complete processes for manufacture. The book discusses a total of 1187 pyrotechnic compositions ranging from black powder compositions, to fireworks, to high performance gun propellants, rocket propellants, incendiary agents, smoke producing mixtures, to specialty compositions including cloud seeding compositions, welding compositions, matches, priming compositions, and experimental compositions, all with a variety of uses, and methods of production. This is an excellent reference book for any pyrotechnician, student, fireworks buff, or any hobbyists/enthusiasts book collection, as well as necessary information when it's needed.